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Siting Survey and Configuration Optimization of a New Regional Array in the Federal Republic of Germany

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This technical report has been reviewed and is approved for publication.

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The project is aiming at a siting survey for an advanced seismic array in the Federal Republic of Germany which could be used in a multi-array network jointly with arrays in Scandinavia to detect and identify seismic events especially at regional distances. In order to assess the eventual capabilities of a new high-frequency array in the FRG, it was necessary to conduct a noise survey and to evaluate signal characteristics, both in the high-frequency band up to 50 Hz.
It was found that the Bavarian Forest (BF) in the southeastern part of the FRG at the border to Austria and Czechoslovakia is principally suited for such an array installation.
Continuous field work has been carried out in this area from April 4 to July 9 1988. This time period covered winter conditions with heavy snow

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in April to summer conditions including farming activities. A portable digital data acquisition system recorded more than 500 seismic events, about half of them occured at local or regional distances.

Representative noise power spectra were calculated for 10 sites in the BF-area. The most favourable ones show values slightly lower than 1 nm**2/Hz at 1 Hz and a smooth decay proportional to f**-4 per decade up to 40 Hz, leading to a value of 10**-4 nm**2/Hz at 10 Hz and 10**-5 nm**2/Hz at 20 Hz.
For comparison a noise sample was taken at NORESS and analyzed with the same procedure. The NORESS power spectrum at 1 Hz is about 10 nm**2/Hz and shows a steep slope proportional to f**-5 at low frequences due to the influence of microseisms. It crosses the BF-spectra at 2 Hz. At frequences above 5 Hz the NORESS spectrum also follows the f**-4 slope with absolute values about a decade lower than the BF-sites (5*10**-5 nm**2/Hz at 10 Hz and 3*10**-6 nm**2/Hz at 20 Hz).
Regional seismograms exhibit the typical phases for continental source-receiver paths. The first arriving Pn-waves constitute the highest frequency waves (5-20 Hz) whereas Lg-wave amplitudes (1-10 Hz) dominate the regional seismogram.
In concluding phase I of the project, one of the quietest BF-sites near the village of Bischofsreut was selected for the establishment of a provisional 9-element array. Data from this installation will be used in phase II to find the correlation properties of signals and noise. The results will lead to a proposal for the configuration of a small NORESS-type array adapted to the local site conditions in the Bavarian Forest.

Table of Contents

1. *Introduction*

Since the establishment of the Graefenberg (GRF) array in 1980, considerable efforts have been made in the Federal Republic of Germany to use array data for seismic monitoring of underground nuclear explosions. Research was focused on discrimination studies using the broadband characteristic of seismic signals. From the very beginning it became obvious that for detection purposes this installation - built for general seismological research - should be amended by a special short-period array. The broadband instruments with a high-cut filter at 5 Hz are not optimal for detection of weak events, especially at regional distances. High frequency signals which seem to be extremely important for the identification of small underground explosions at regional distances are not detectable on records of the broadband array. On the other hand, initial results from a small-size (3 km diameter) 25-element short-period array in Norway (NORESS) have been very encouraging, as the array has proven capable of taking advantage of the very efficient propagation of high-frequency seismic phases in Eurasia. Together with a similar recently installed array in Northern Norway (ARCESS), the proposed array in Southern Germany (tentatively named GERESS = German Experimental Seismic System) would built a tripartite array network with a side length of a triangle being roughly 1000 km. This configuration is particularly relevant in view of a possible deployment of "in-country" seismic systems.

Unlike NORESS it is not possible to collocate the new short-period array with an existing GRF subarray because the latter is built on a sedimentary column which strongly attenuates high frequencies.

The Bavarian Forest at the southeast border of the FRG to Austria and Czechoslovakia represents the largest outcropping crystalline complex - as part of the Bohemian Massif - in Central Europe. This region is principally suited for an array installation of the proposed kind as has been demonstrated by the excellent detection capabilities of conventional seismic stations in the CSSR and Austria. But in the FRG the environment has to be carefully investigated due to

human and industrial noise sources. Apart from these local noise conditions, sufficient seismic signals from various azimuths should be recorded and evaluated to assess the propagation of high-frequency signals, especially across geological boundaries like the one between the Russian Platform and Western Europe or the influence of the Alps on signals originating from the Mediterranean earthquake region.

After describing the field work in the next chapter, a noise analysis will be evaluated in chapter 3. Besides a comparison of the 10 test sites which were measured during a 3 months campaign, an additional noise sample was taken at NORESS. This power spectrum will serve as a reference to judge on the spectral noise conditions at the proposed new array site in Southern Germany.

A low noise profile is only one condition for a reasonable seismometer site. Equally important is the transfer function of the receiver crust which determines the signal characteristics and the signal-to-noise ratio. Having operated the seismic data acquisition system in a detector mode we were able to analyze more than 500 signals. In chapter 4 the general detection capability will be discussed for a site in the Bavarian Forest area, then we shall focus on recordings of regional events and finally a collection of seismograms from presumed underground nuclear explosions will be shown with special emphasis on the two events included in the US-USSR Joint Verification Experiment.

In a concluding chapter 5 an outlook on future work will be given which has to be done in phase II of the project. This phase will concentrate on correlation studies for noise and signals after the most promising site has been selected for the provisional installation of a 9-element small array.

2. *Field Work*

During phase I of the project the siting survey was completed and final results of the noise analysis are now available. Measurements have been carried out initially in October 1987 and from April 5 to July 9 1988 continuously. Some additional data have been collected later in 1988 to prove the long-term variability of noise conditions and to calibrate the results with data from well-defined events (e.g. JVE-experiment).

The measurements concentrated on an area in the Bavarian Forest (Bayerischer Wald) in the southeastern edge of the FRG (figure 2a). The advantage of this area is its geological setting (crystalline outcropping rocks from the Bohemian Massif) and the low population density. The landscape is mostly mountainous up to 1200 m elevation. Nearly all sites were situated in extensive forest areas to minimize cultural noise and instruments were installed on granite or gneiss rocks to record high frequencies, especially from events at regional distances. By this temporary surface installation the seismometers were quite sensitive to wind noise but for technical and financial reasons no other arrangement was feasible. Detection capabilities derived from noise estimates of these data should represent conservative values.

For survey purposes three portacorders with direct recording were used. In case of favourable places one of three digital data acquisition systems was installed for a time period of several weeks. The digital systems were PCM recording instruments of Lennartz 5800 type with the following specifications :

ADC	66 dB resolution
gain ranging	126 dB dynamic range
sampling frequency	250 Hz
lowcut filter	44 Hz, 6 pole Bessel

Each PCM system was equipped with three vertical short-period seismometers (1 Hz Geotech S-13) which were installed at distances between 100 m and 300 m to avoid false alarms by coincidence triggering.

The survey concentrated on three areas within the Bavarian Forest (figure 2b) :

a. the southern region (south of the city of Hauzenberg)
b. the northern region (northeast and southwest of Frauenau)
c. the central region (east of the city of Freyung).

Station coordinates and station codes are summarized in table 1. A brief description of the recording sites is as follows :

In the southern area stations were installed near Kleinrathberg (KLRB), Sonnen (SONN) and Steinbuechl (STEI). KLRB began its operation already in early April when the whole region was covered with snow. The other two stations recorded under summer conditions. All southern stations were based on solid granite. At night these sites were very quiet as could be seen on the portacorder. However during day times not only farming activities but also some large quarries in the vicinity increased the noise level significantly.

In the northern area, at first the station Buchenau (BUCH) was set up. It operated simultaneously to KLRB in the south under the same weather conditions (snow). The other station, Dreikoegelriegel (DRKR) was situated southwest of Frauenau at a distance of approximately 10 km from BUCH. Both stations were placed on gneiss. Although the geological conditions looked quite promising the general noise level was influenced by traffic and tourism. Additionally small industries seemed to contribute some background noise.

Very soon the site survey concentrated on the central area which is closest to the CSSR border. Very few roads, low population density, and extensive woodland offered adequate pre-conditions for seismic installations. The first station near Haidmuehle (HAID) was established in April. It was placed on weathered granite. Later, two other stations at Gross-Lichtenberg (GRLB) and Kiesberg (KIBG)

were established on gneiss. During the JVE-experiment an additional station was installed at Sulzberg (SULZ). Portacorder records showed a generally low noise background and especially a small day-to-night variation. The only obvious disadvantage appeared to be some saw-mills which generated monochromatic seismic noise during working hours.

A summary of the recording times of field stations in the Bavarian Forest is given in table 2.

For comparison some noise samples have been taken at the Graefenberg array (station B5) which confirmed earlier measurements showing relatively high cultural noise levels.

Finally during a short trip to Norway in October 1988, some recordings were made at NORESS to get a direct comparison of noise values by using the same data acquisition system and - more important - the same processing procedure as for data from the area under investigation in Germany.

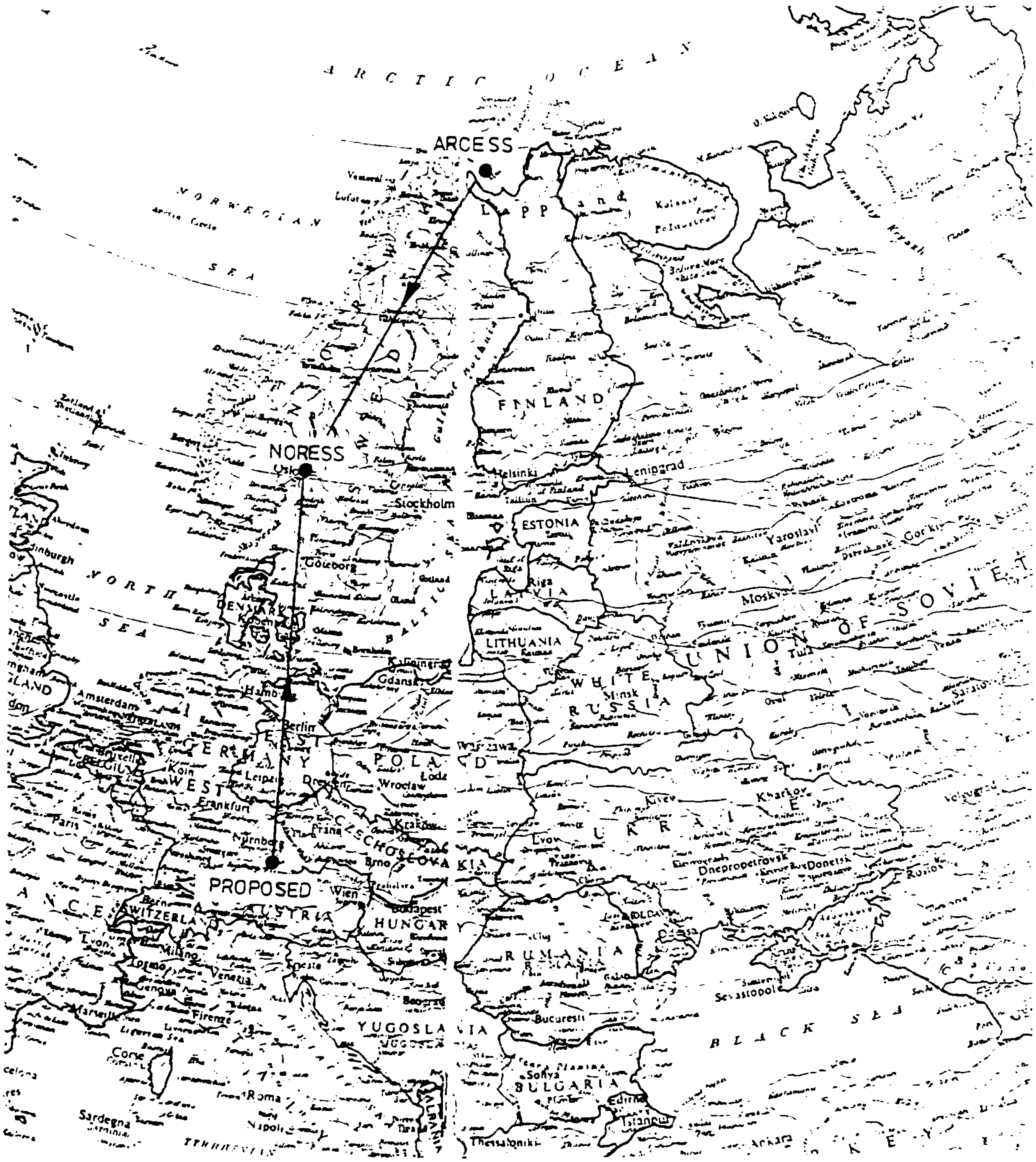


Fig. 2a : Geographical Location of the Proposed German Array (GERESS) in Relation to Existing Scandinavian Arrays.

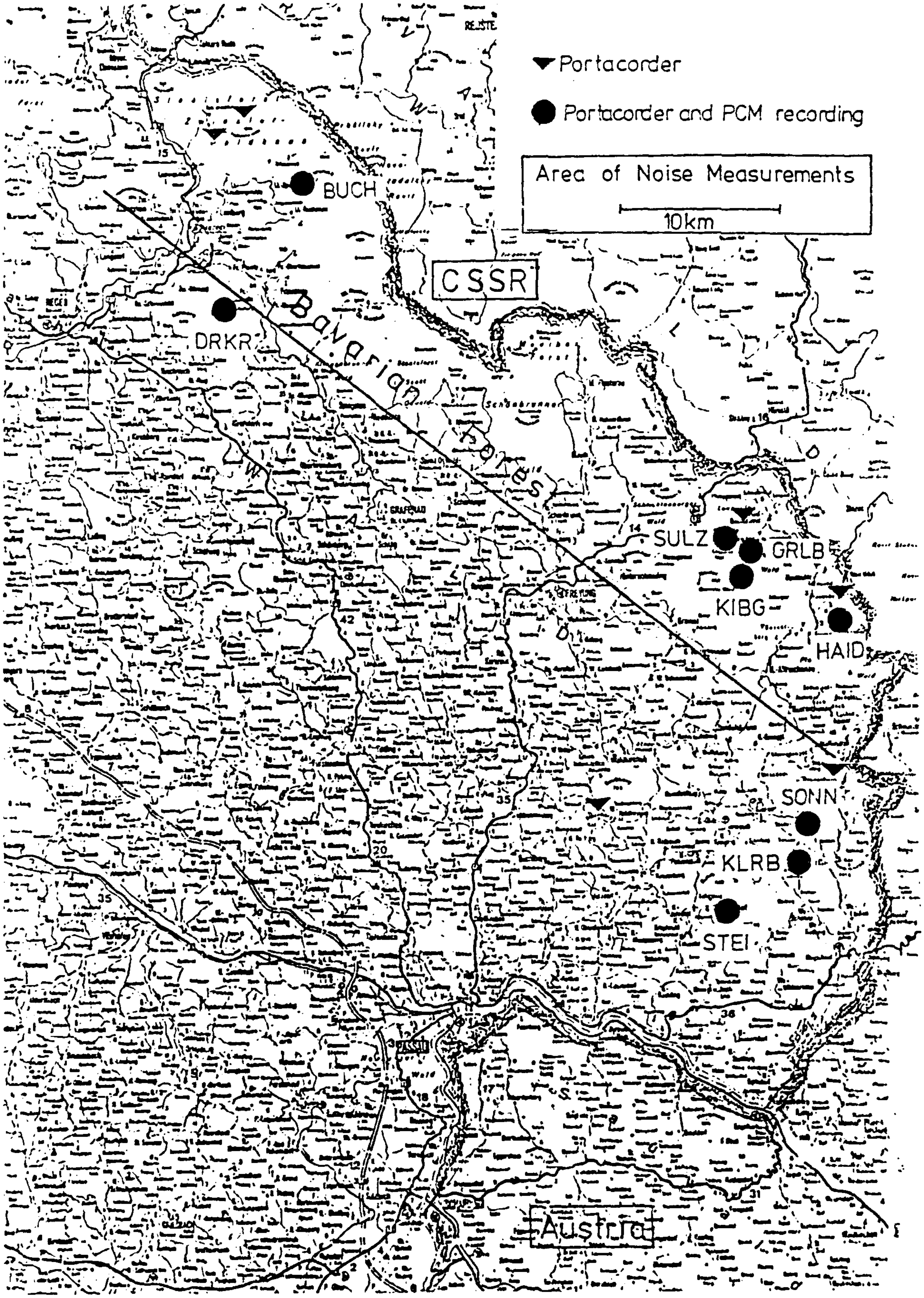


Fig. 2b : Location of Field Sites for Noise Measurements

station name	code	area*	lat	long
Buchenau	BUCH	n	49.051 N	13.333 E
Dreikoegelriegel	DRKR	n	48.967 N	13.26[illegible] E
Gross-Lichtenberg	GRLB	c	48.838 N	13.720 E
Haidmuehle	HAID	c	48.800 N	13.786 E
Kiesberg	KIBG	c	48.820 N	13.704 E
Kleinrathberg	KLRB	s	48.641 N	13.748 E
Sonnen	SONN	s	48.679 N	13.778 E
Steinbuechl	STEI	s	48.622 N	13.698 E
Sulzberg	SULZ	c	48.845 N	13.700 E

*area : n = northern area
c = central area
s = southern area

Table 1 : Site Coordinates

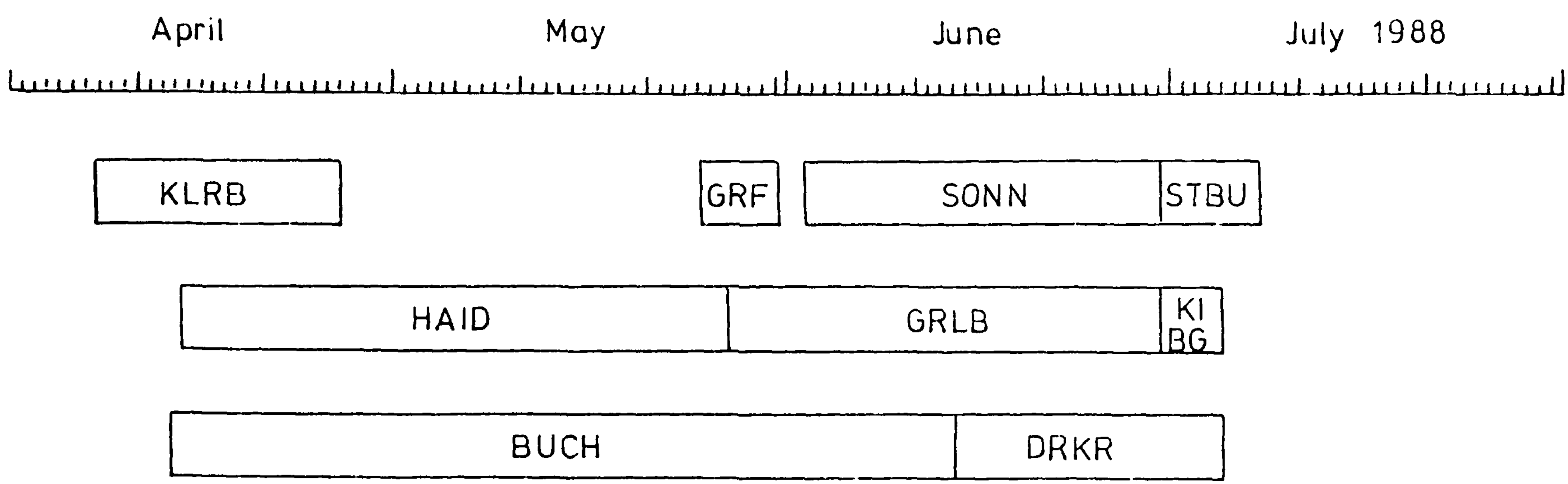


Table 2 : Recording Times of Field Stations

3. *Noise Analysis*

The processing of field data included several steps. At the beginning the PCM field tapes had to be converted to standard 9-track IBM-compatible format. Then an appropriate file system was established on the SUN computing system of the Institute of Geophysics in Bochum. The CSS-format was used for this and also for the waveform data file. In this way the data could also easily be transferred to DARPA's analysis centre in Washington.

Having recorded the field data in event mode the pre-event window can be used for noise evaluation. There are many well-established methods to estimate the power spectral density of stationary time series (e.g. Oppenheim and Schafer, 1975; Welch, 1967). In this report the following procedure was applied :

Altogether 20 seconds of the pre-event window were divided into 19 blocks of 2 seconds length each with an overlap of one second. Each data block was padded with zeros to get a transformation length of 2^{10} for FFT reminding that the original sampling frequency of the field data was 250 Hz. The 19 raw Fourier spectra were averaged to lower the variance without affecting stationary noise peaks. The final step includes an average of 12 noise spectra from each station and a plot of the mean values and their standard deviation.

The noise spectra (figure 3a-k) are calculated separately for day and night. They cover the whole time period during which the corresponding station was operating. By that procedure, working hours, weekends, and different weather conditions are included in the noise estimate.

The noise power spectral density of each station will be discussed in the same order as the station sites in the previous chapter.

In the southern area, Kleinrathberg (KLRB) showed the highest noise level we measured in the Bavarian Forest (figure 3a). Typical for this site is a broad maximum with values about 10^{-3} nm^2/Hz between 10 Hz and 20 Hz. This plateau is dominated by a noise peak at 11 Hz which can be observed at all southern stations KLRB,

SONN, and STEI. Another maximum can be seen at 2 Hz, especially during night times. Whereas the 11 Hz peak presumably originates from a local source, the 2 Hz maximum can be found on most European recordings. At working hours this peak is masked by a generally higher noise level but it can still be identified. The relatively high noise level between 5 Hz and 20 Hz in the southern area is caused by farming activities, small industries, traffic and quarries. Additionally this area is more densely populated than the other investigated regions. The station at Sonnen (figure 3b) shows a low noise level for frequencies above 20 Hz. Besides the already known maxima at 2 Hz and 11 Hz, we find a sharp noise peak at 16.67 Hz (railroad ?). The third site in the southern region, STEI, was placed in an abandoned quarry. During night times it shows low noise values over the whole observed frequency range (figure 3c). The installation of the seismometer on the ground of the quarry about 50 m below surface level gives an excellent opportunity for comparison with the surface installations in this area. Although the improvement, i.e. noise decrease is remarkable at night, the local noise at day times is still present.

In the northern area the spectra generally show a much smoother behavior. Up to 20 Hz the spectrum of the station at Buchenau (BUCH) in figure 3d exhibits a continuous decay but for higher frequencies several maxima appear, especially in the range between 20 Hz and 30 Hz. The spectrum of the second station in this region, DRKR, shows a similar shape, except for a higher variance during working hours (figure 3e). This may be caused by larger villages around the site. In general, the noise level is somewhat lower than at BUCH but it is still high compared to the most favorable sites which were found in the central region of the survey.

In the central area Haidmuehle (HAID) was the station which was installed at the beginning of the survey. Its noise estimate (figure 3f) includes data from times when the ground was covered with snow and also from summer times. In the individual spectra no significant difference could be observed. The spectrum shows a continuous slope with a small variance and even the 2 Hz peak can only be recognized during night times. The day spectrum is dominated by a

noise maximum at 4-5 Hz which is supposed to originate from a saw mill at a distance of a few kilometers in the village of Haidmuehle.

The spectra of the second station in that region, GRLB, show the smallest day/night variation we observed (figure 3g). The only difference remains the influence of the already mentioned saw mill. Its distance from GRLB and HAID is about the same. Apart from this peak, the noise spectrum at GRLB shows a smooth decay proportional to f^{-4} from 1 Hz to 30 Hz and a small standard deviation. Taking into account that the recording time covered nearly a period of one month, this area seemed to be quite promising as a candidate for an array installation.

To secure this suggestion, two other sites were explored in the vicinity. Indeed, the spectra at Kiesberg (KIBG), situated approximately 2.5 km south of GRLB, look very similar (figure 3h). The only difference can be seen at 2 Hz where we identify the well-known noise peak. Because the data at both stations have been collected at different time periods we have to expect this noise influence at every station during a more permanent operation.

Later in 1988 (September and October), some additional data were collected at Sulzberg (SULZ), approximately 1.5 km northwest of GRLB.

This fourth station (figure 3i) in the central area of the survey confirmed the favorable opinion about the area and provisions were started to establish a multi-element array during phase II of the contract.

To put our noise results from the Bavarian Forest into proper place, additional data were collected at the Graefenberg array and at NORESS. GRF can be regarded as a typical European site whereas NORESS is well known for its excellent noise conditions being situated on the Scandinavian shield.

At day the GRF-spectrum (figure 3j) shows much larger values than any of the BF-spectra. The influence of industry and traffic is especially pronounced in the large variation. The night-spectrum at

GRF looks similar to the BF-spectra between 1 Hz and 8 Hz. For higher frequencies the different geological setting (sediments) causes still higher noise values. From this direct comparison we can conclude that the BF-area exceeds most other places in the FRG - and certainly GRF - as a potential site for an establishment of a high-frequency array.

More interesting is the comparison of the proposed Bavarian area with NORESS. The spectra shown in figure 3k were calculated from a 24 hour noise sample analyzed with the same procedure as described above. There are remarkable differences in the noise spectra. For low frequencies around 1 Hz NORESS clearly suffers from the influence of the coast which results in an order of magnitude higher PSD-values compared to the Bavarian Forest area (10 nm^2/Hz to less than 1 nm^2/Hz). Apparently this high micro seisms lead to a steep slope of the spectrum proportional to f^{-5} up to frequencies of 2-5 Hz. For higher frequencies this slope is flattened and comparable to the f^{-4} fall-off at the BF-area. The absolute noise values at 10 Hz and 20 Hz are certainly lower at NORESS but interestingly some influence of industrial noise between 5 Hz and 8 Hz can be identified in the spectrum at day and at night as well. Whether the sharp noise peak at 30 Hz was only occasional during the short period of data acquisition cannot be decided from this noise sample.

In concluding the comparison between NORESS and the BF-area we found a factor of 10 higher noise values at NORESS for frequencies around 1 Hz and a factor of 2-3 higher noise values at the BF-site for frequencies between 2 Hz and 20 Hz. The consequence of this difference in terms of detection capabilities can only be evaluated in comparison with commonly recorded events.

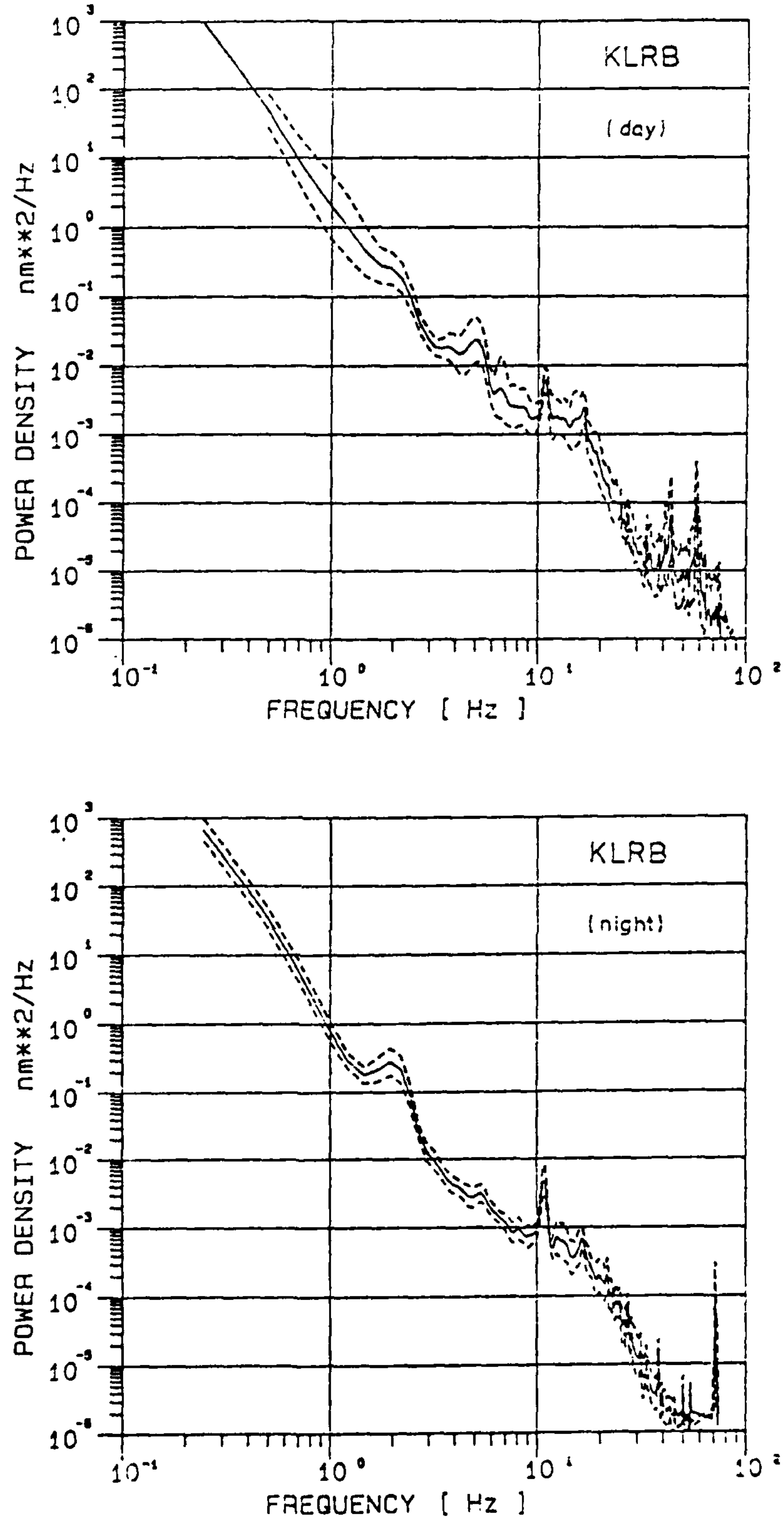
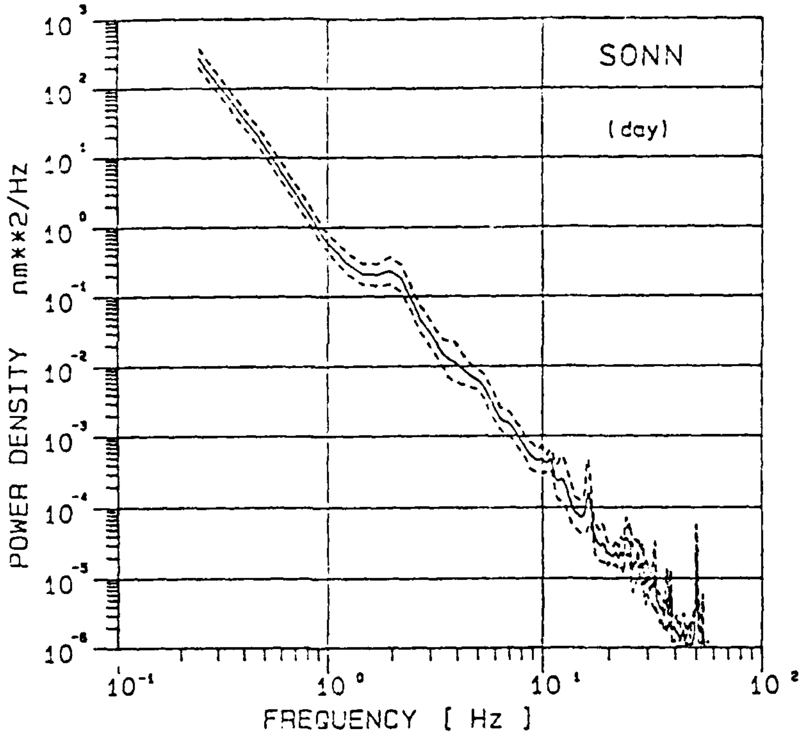


Fig. 3a : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station KLEINRATHBERG



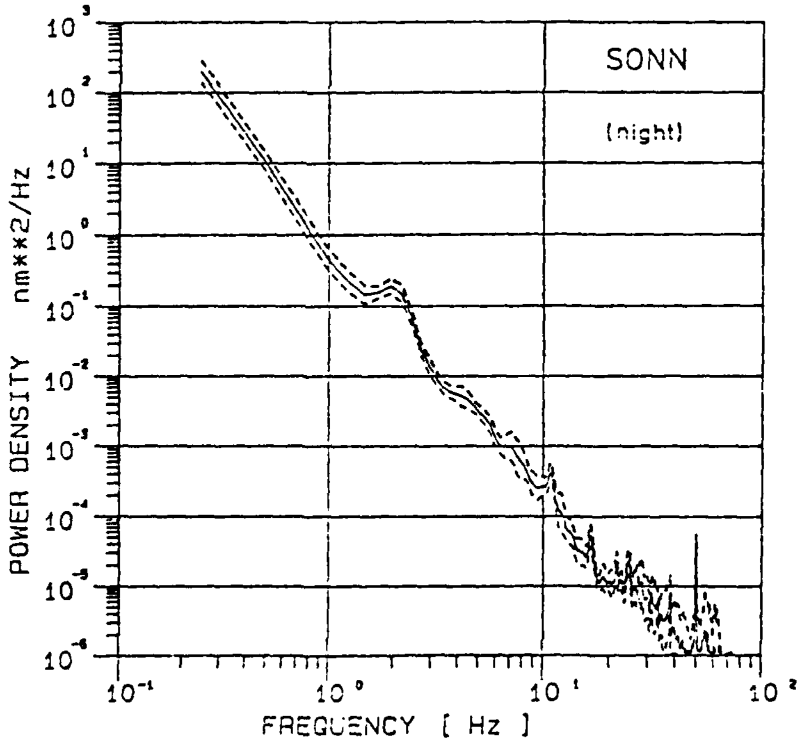
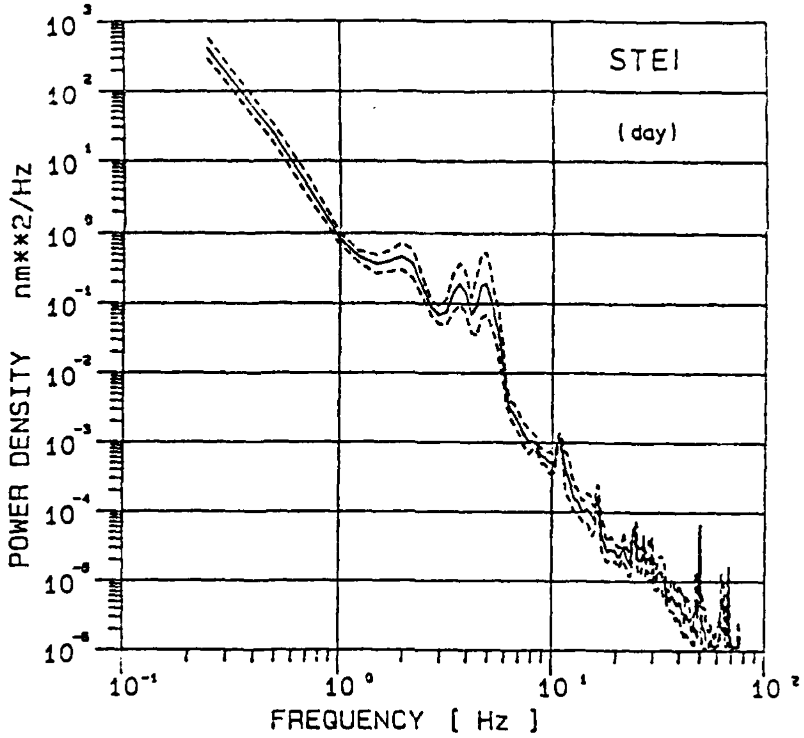


Fig. 3b : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station SONNEN



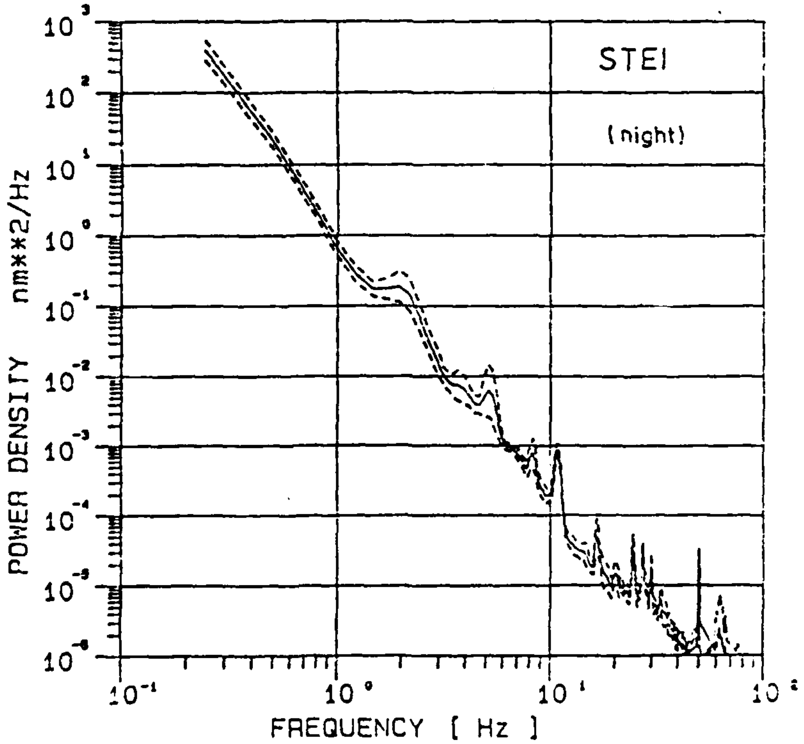


Fig. 3c : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station STEINBUECHL

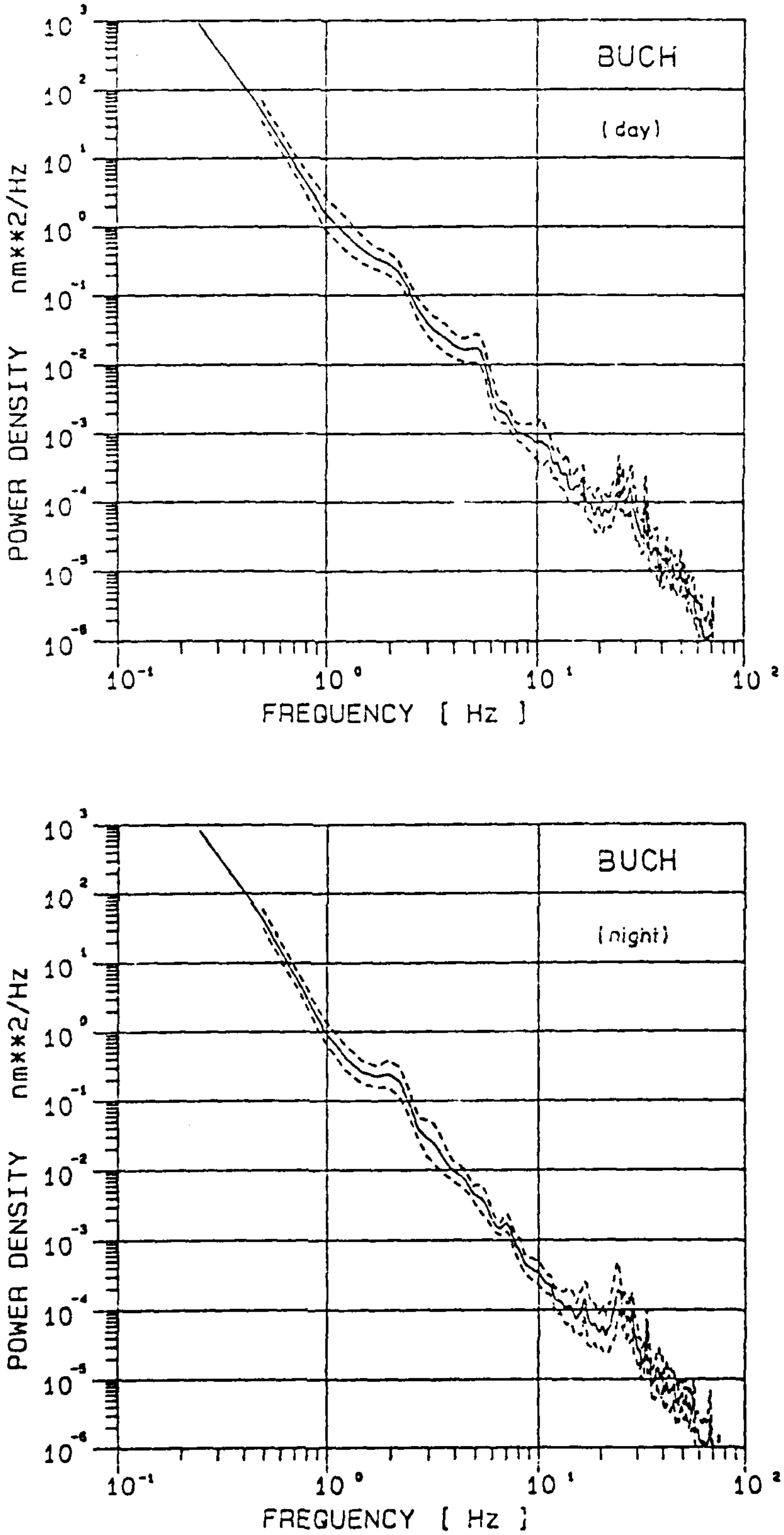


Fig. 3d : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station BUCHENAU

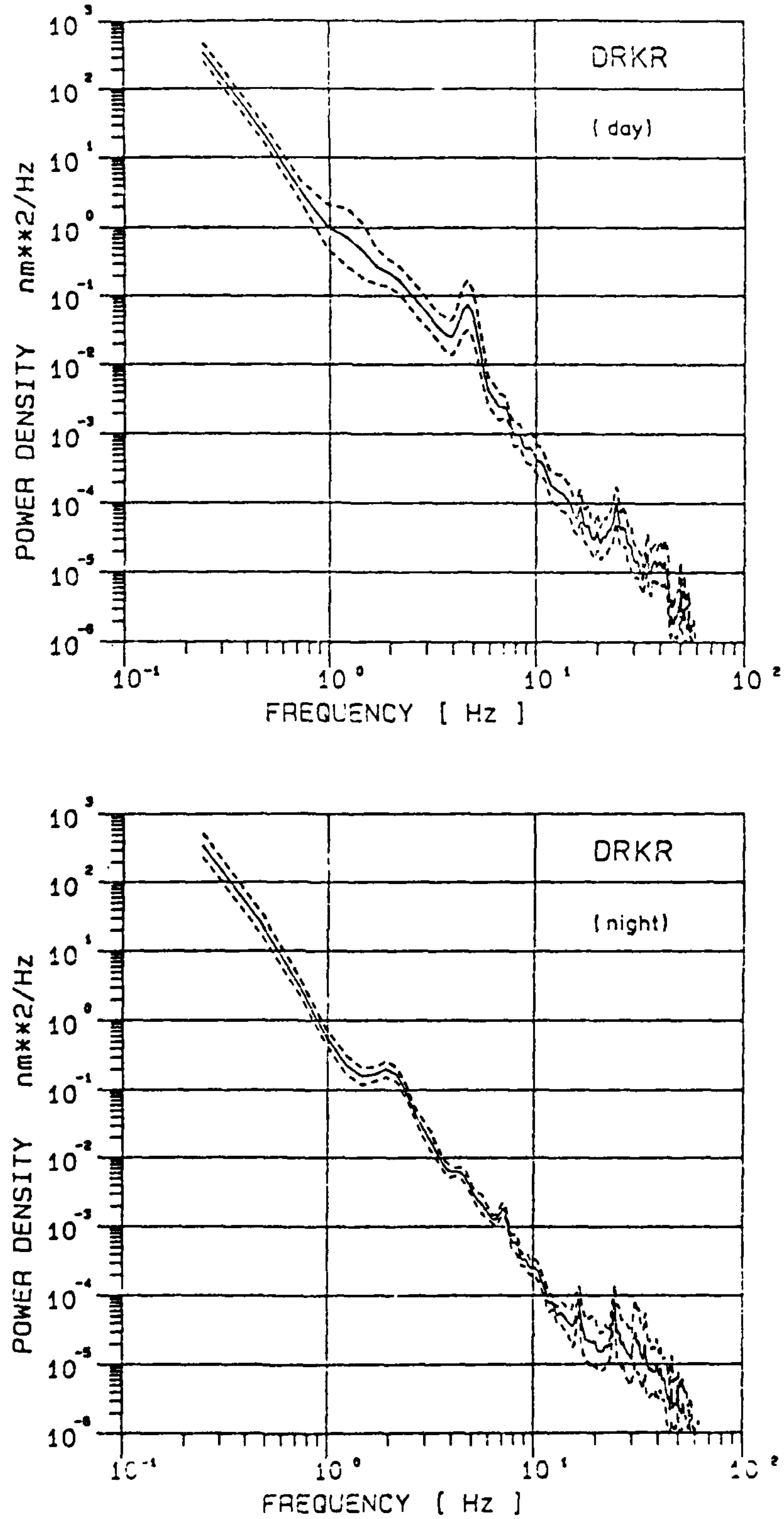


Fig. 3e : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station DREIKOEGELRIEGEL

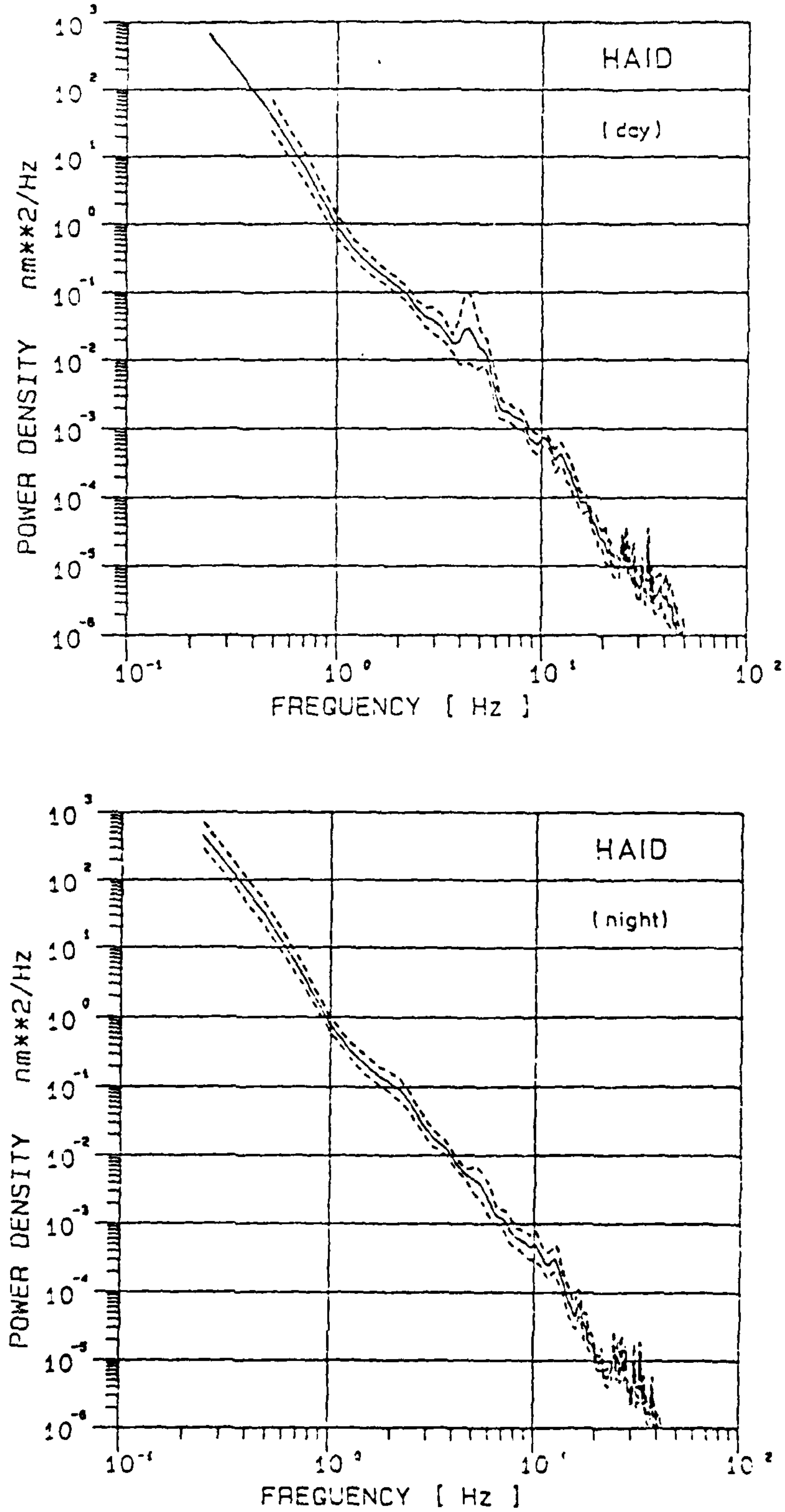
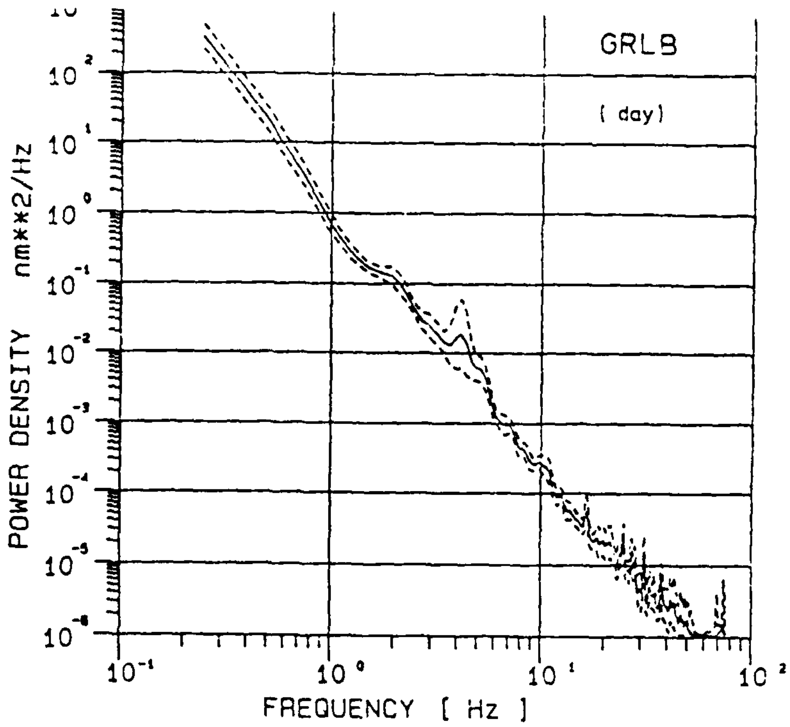


Fig. 3f : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station HAIDMUEHLE



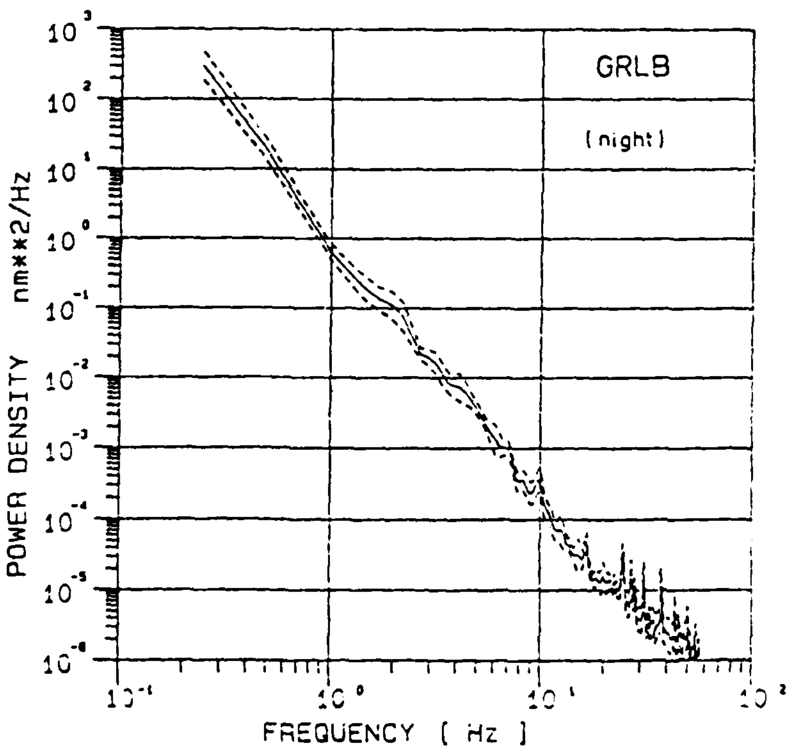


Fig. 3g : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station GROSS-LICHTENBERG

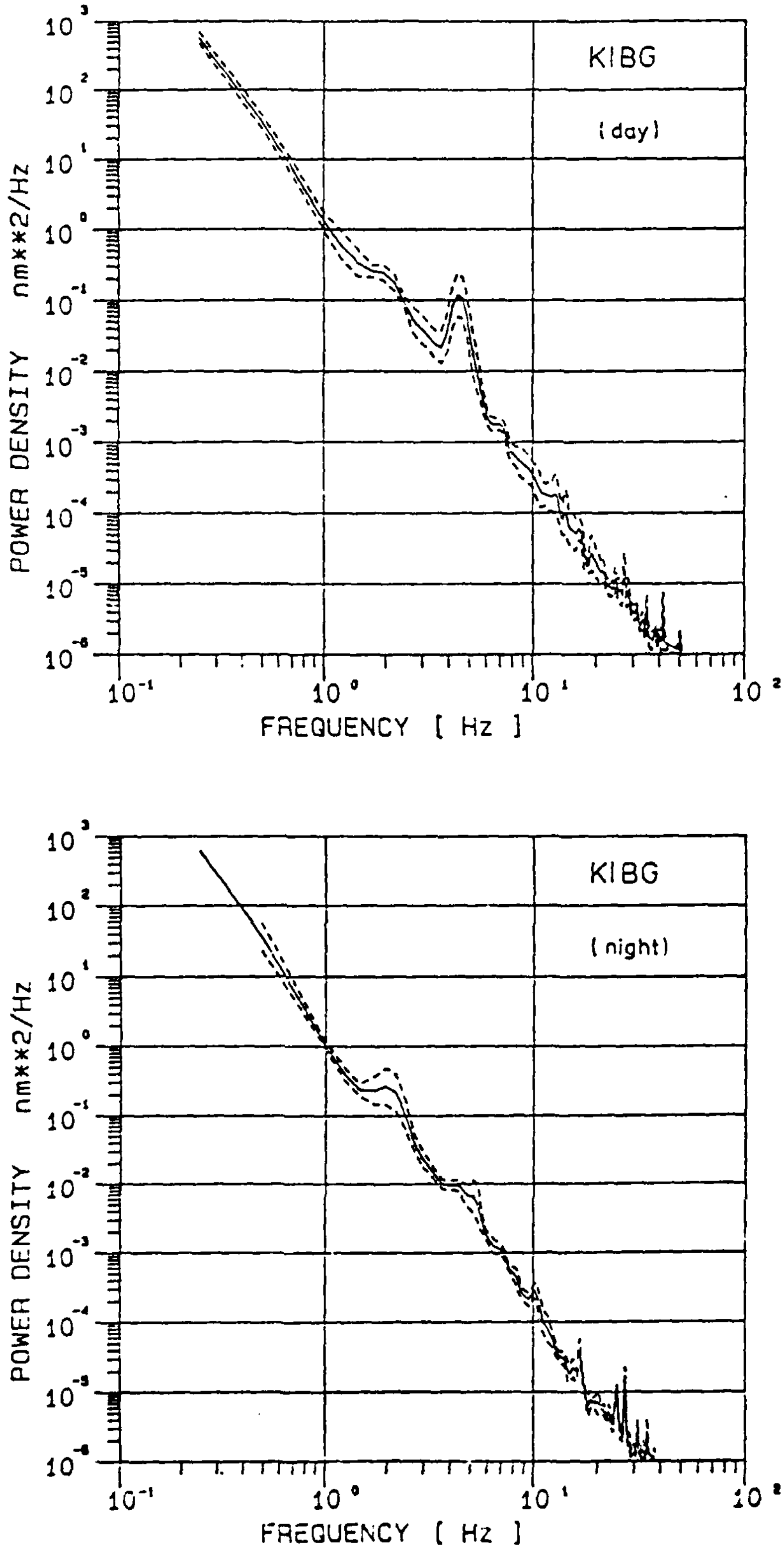
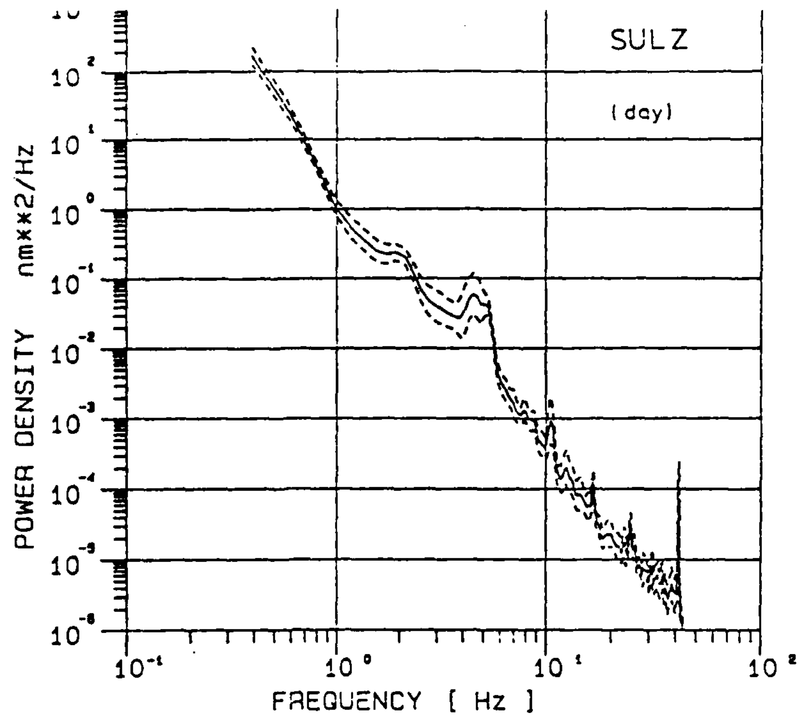


Fig. 3h : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station KIESBERG



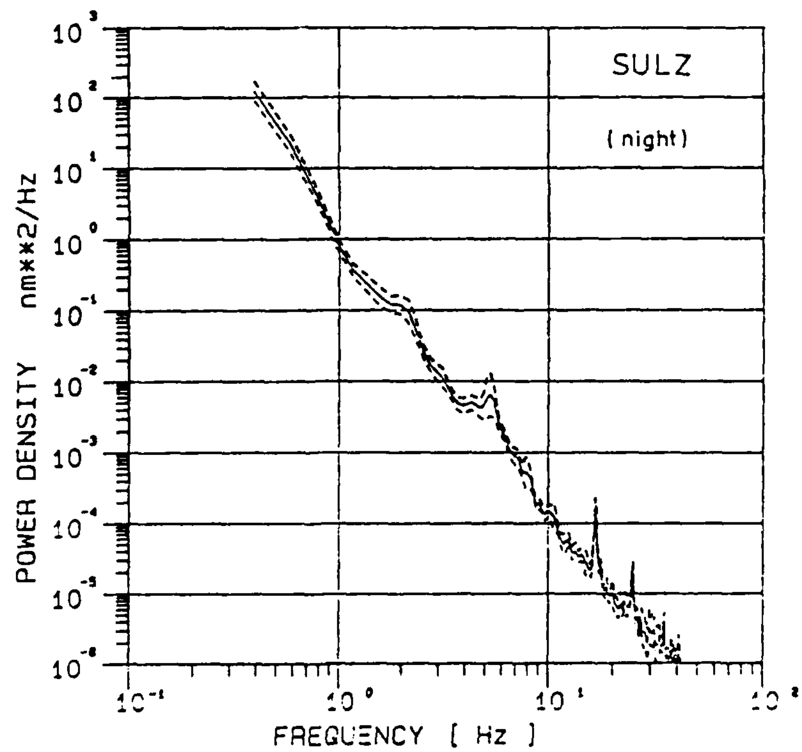
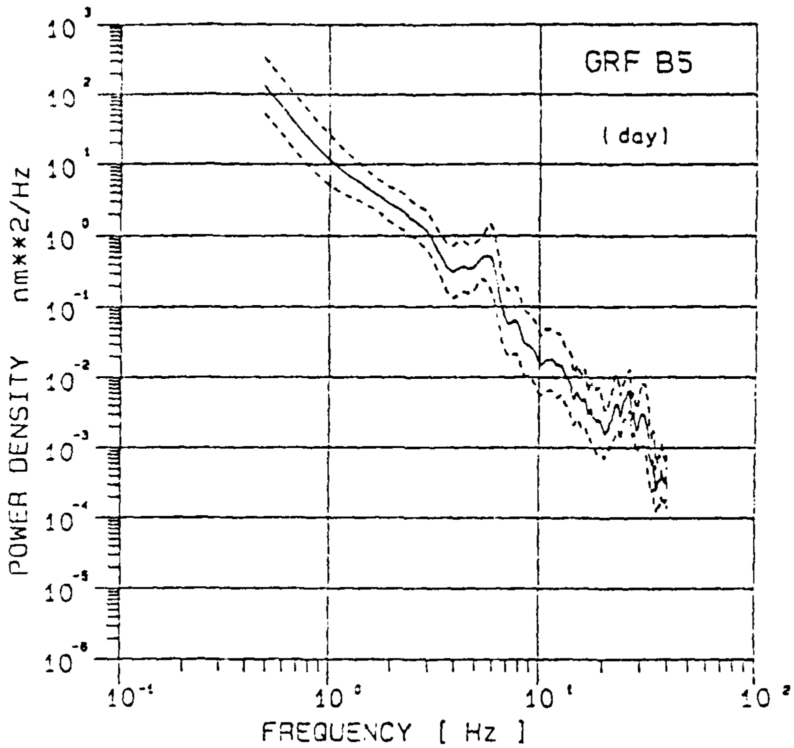


Fig. 3i : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station SULZBERG



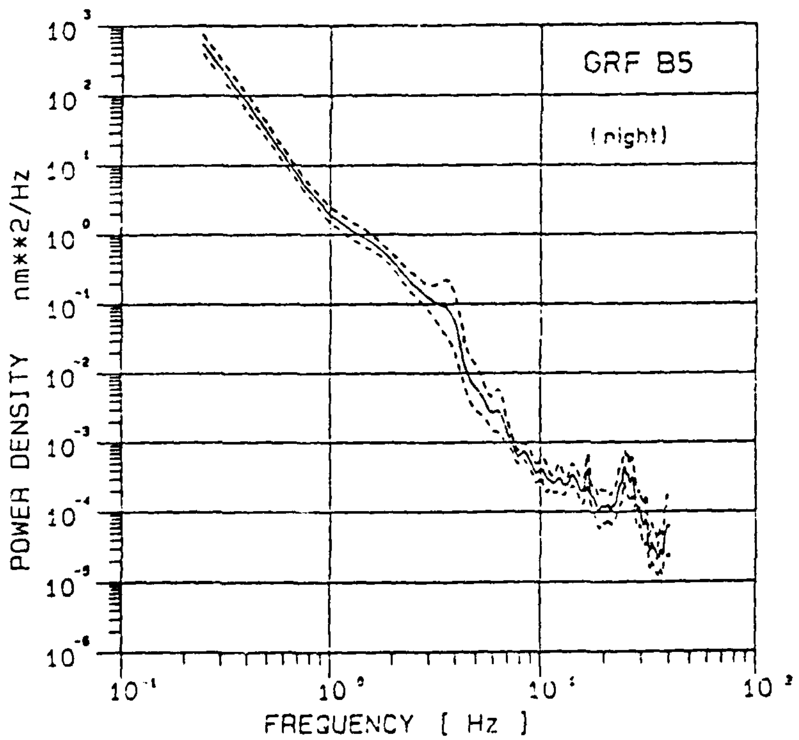
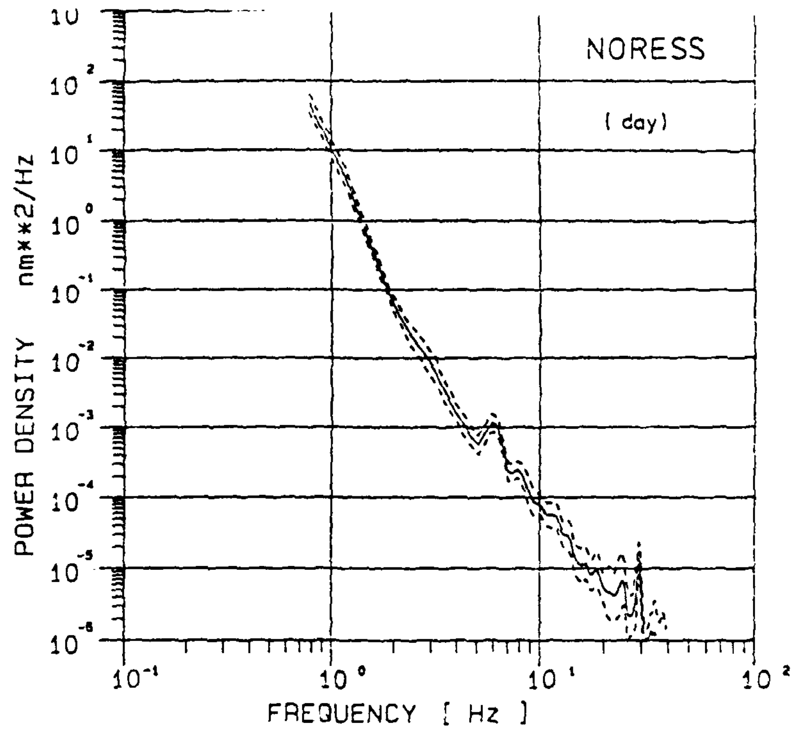


Fig. 3j : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station GRAEFENBERG



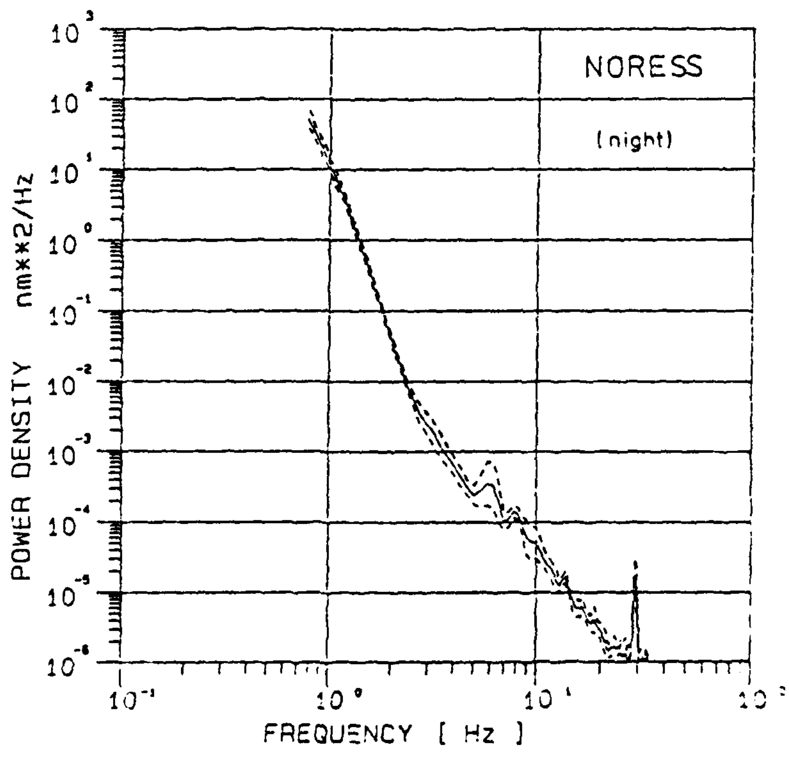


Fig. 3k : Spectral Power Density Estimates of Noise (mean and standard deviation) for Station NORESS

4. *Event Recordings*

During the noise survey the data acquisition system principally operated in detection mode as outlined in chapter 2. A conventional STA/LTA-detector algorithm was applied. Using an updating LTA the recording length was variable but generally the complete interval between Pn-waves and Lg-waves was recorded.

After inspection of the detection times which were compared with various bulletins, i.e. PDE for teleseismic events, NORSAR and EMSC (European Mediterranean Seismic Centre) for regional seismicity and the GRF-monthly bulletin for local events, the corresponding waveforms were extracted from the original data which filled about 80 digital tapes (2400", 1600 bpi). When three field stations had triggered, an independent epicentre determination was carried out for local events.

Although the whole field campaign lasted for a time period of more than three months, the actual recording time covered only 60 days. The remaining time was needed for setting up stations, changing batteries, and preparing new sites.

During the 60 days 504 events were detected and evaluated. About half of these events (265) were found to be teleseismic, 93 occurred at regional distances (150 km - 2000 km), and 146 events were classified as local seismicity. All events were plotted and tabulated in a station bulletin which is attached as an appendix to this report.

4a. *Global Detection Capability*

Data from a field survey with a recording time of 60 days can only give a rough estimate of the global detection capability of the investigated site. A permanent seismometer installation in a vault will certainly diminish the influence of wind noise. On the other hand, even a preliminary evaluation should show a correspondence between the detection threshold which can be inferred from the noise level and that from actual data.

In figure 4a a magnitude-frequency histogram is shown which includes all detected events with epicentral distances larger than 2000 km. From this diagram we derive an overall teleseismic detection threshold at about $m_b = 4.5$. A simple calculation yields a corresponding noise level of 2-4 nm at 1 Hz assuming an S/N-ratio of 2 for detection. This value is comparable to the power spectral estimates found in the area.

A peculiarity of the Bavarian Forest area with regard to teleseismic detection capabilities is certainly the large number of PKP-phases. 88 events - or roughly one third of the total 265 teleseismic detections - were PKP-detections originating from the Pacific. In fact, all detected teleseismic events with magnitudes less than $m_b = 3.6$ were identified as PKP-events. This result clearly demonstrates the potential of arrays on the Northern Hemisphere for monitoring special sites on the Southern Hemisphere as will be further shown in subchapter 4.c .

4b. *Regional Event Recordings*

As the planned array in the Bavarian Forest area is specifically aiming at high-frequency seismology, particular emphasis was given to recordings of regional events. During the field campaign, 93 events were recorded in a distance range of about 150 km to 2000 km. These events cover all azimuths although the majority of events are incident from east or southeast directions.

The Polish copper mines near Lubin and the coal mines in Upper Silesia contribute 19 events to the whole data set. Epicentral distance is 338 km and 411 km, respectively from the central area (GRLB). The spectral behaviour is quite different. Whereas the seismograms from Lubin copper mine show a very consistent picture with distinct Pn-, Pg-, and Lg-phases and relatively high frequencies (figure 4b), the seismograms from Upper Silesia coal mines are more complex (figure 4c), high frequencies are missing and often no clear Pn-onset can be defined. Several times the detector triggered on Lg-amplitudes for these coal-mining induced events, in contrast the detector never missed the Pn-arrival for Lubin events of comparable size.

Apart from these differences which are presumably related to the source process, variations of regional phases merely come from crustal differencies on the wave path. To the north and west of the investigated site, there are thick sedimentary layers which should attenuate high frequencies. The seismicity of these regions (central and northern Germany, France) is relatively low, but we recorded one M_L = 2.3 event from Eisenach/GDR, epicentral distance 328 km to the north (figure 4d) and a magnitude M_L = 2.5 event from France at a distance of 506 km to the west (figure 4e).

To the east several quarries in Czechoslovakia produce seismic signals. Many of these are at distancies less than 150 km and contribute to the 146 detected local events which also originate from quarries in southern Germany and from a few earthquakes in the Austrian Alps. Figure 4f shows an example of a recording of a CSSR event at 340 km distance. Remarkably large amplitudes can be seen

in the 5 Hz - 20 Hz bandpass-filtered trace.

To the southeast of the BF-site the activity of the Eurasian earthquake belt is monitored. In ascending distance we recorded earthquakes from Jugoslavia (distance = 330 km), the Adriatic Sea (distance = 750 km), Greece (distance = 1300 km) and Turkey (distance = 1450 km).

Typical spectral differencies can be revealed from two different Adriatic Sea earthquakes which occurred in the same source region, figure 4g shows a magnitude m_b = 5.3 event compared to a m_b = 3.8 earthquake.

At distances of 1000 km and more the waveforms from earthquakes in Greece and Turkey as well as from southern Italy and northern Africa are very complex, no significant signal energy can be recognized above 10 Hz. Whether this observation generally depends on the heterogeneous wave path or whether it results from our limited data set, needs further investigation.

4c. *Records of Nuclear Explosions Including the JVE-Events*

None of the established sites for underground testing of nuclear weapons is within regional distances from the Bavarian Forest area. The epicentral distance to the Soviet test site in Kazakhstan is 41.3^{o} and to Novaja Semlja 30.5^{o} , the distance to NTS is 83.6^{o} , and the French test site at Mururoa is in PKP-distance of 145.6^{o} .

The following presumed explosions were recorded with various field stations :

Kazakhstan	Nevada	Mururoa
4.5.88	2.6.88	11.5.88
14.6.88	7.7.88	25.5.88
14.9.88	17.8.88	16.6.88
		23.6.88

Records from the JVE-events seemed to be of specific interest. A station was temporarily installed in the central area of the Bavarian Forest near the village of Bischofsreut at the GRLB-site (compare chapter 2). Figure 4h shows one trace of the Nevada explosion together with the signal and noise spectrum. The explosion yielded an amplitude of 32 nm at a period of 1.2 sec (m_b = 5.42).

Figure 4i shows the Kazakhstan explosion, in the upper part of the figure again the signal and noise spectra are plotted. For this event a P-amplitude of 320 nm at a period of 0.96 sec was measured (m_b = 6.03). Comparing the spectra from figures 4h and 4i, the Nevada explosion already vanishes at 2 Hz in the noise spectrum whereas the Kazakhstan explosion dominates the noise spectrum up to 8 Hz. At the moment it cannot be decided whether this difference is a source or path effect or both.

As already mentioned the BF-area is within the PKP-focus to Mururoa test site. The excellent detection capability for this distance can be demonstrated by the record of a presumed explosion on

16.6.88 which was only reported by the seismological agency in New Zealand. This event (figure 4j) does not appear in any other published bulletin (e.g. NEIC, NORSAR etc).

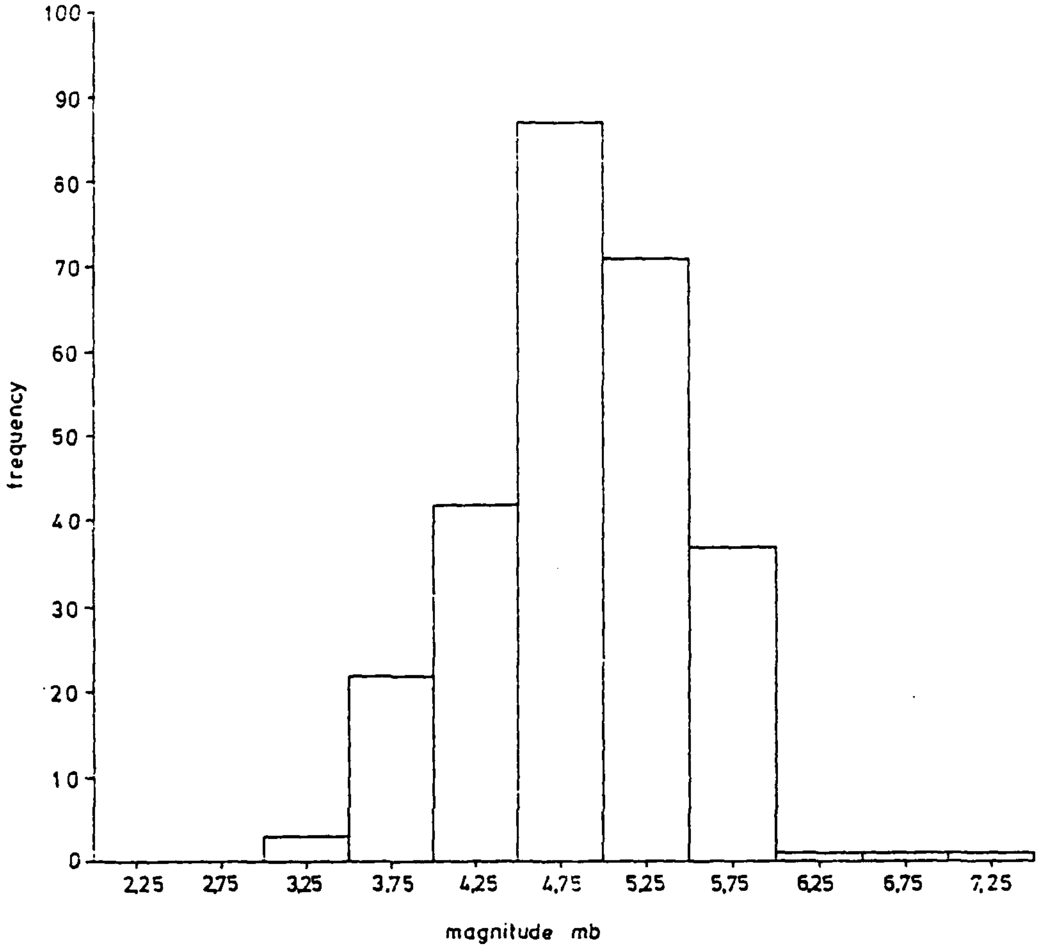


Fig. 4a : Magnitude-Frequenzy Histogram of Detected Teleseismic ($\Delta > 2000$ km) Events

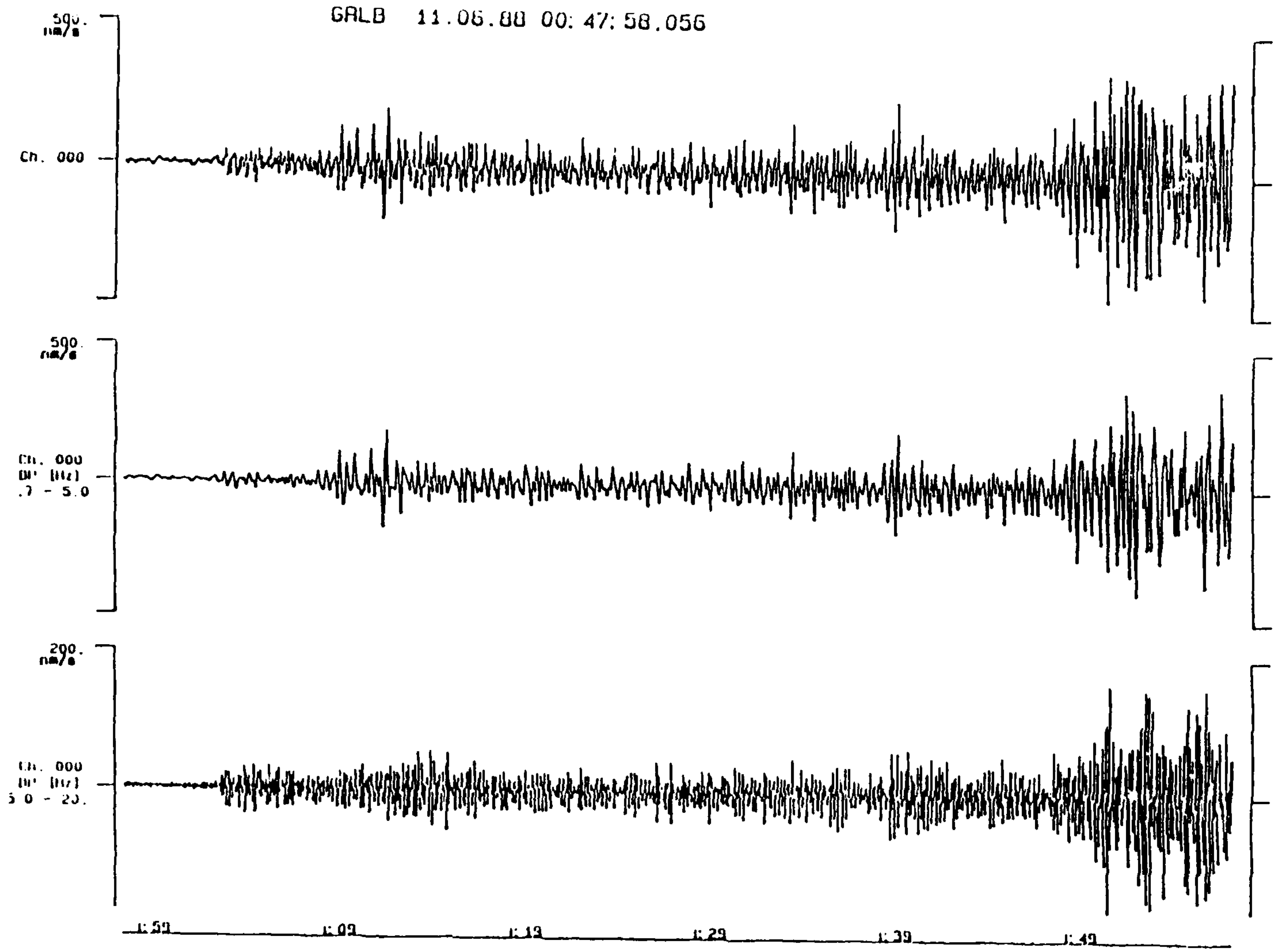


Fig. 4b : Lubin (Copper Mine) Event : $M_L = 3.6$, $\Delta = 338$ km
Original Recording (top), Lowpass (middle) and Highpass (bottom) Filtered Trace

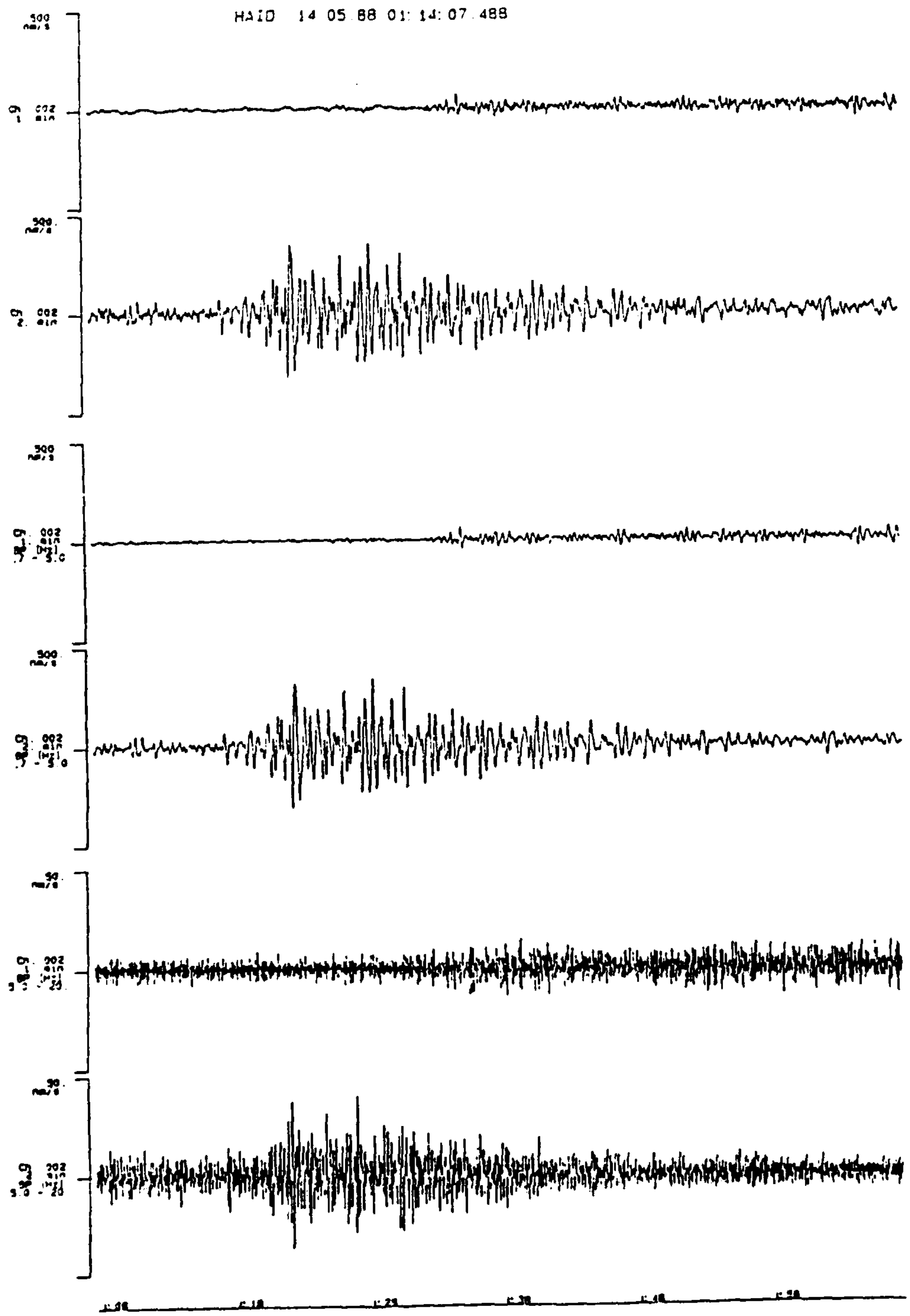


Fig. 4c : Upper Silesia (Coal Mine) Event, $M_L = 3.1$, $\Delta = 411$ km
Original Recording (upper traces), Lowpass (middle)
and Highpass (bottom traces) Filtered Seismograms

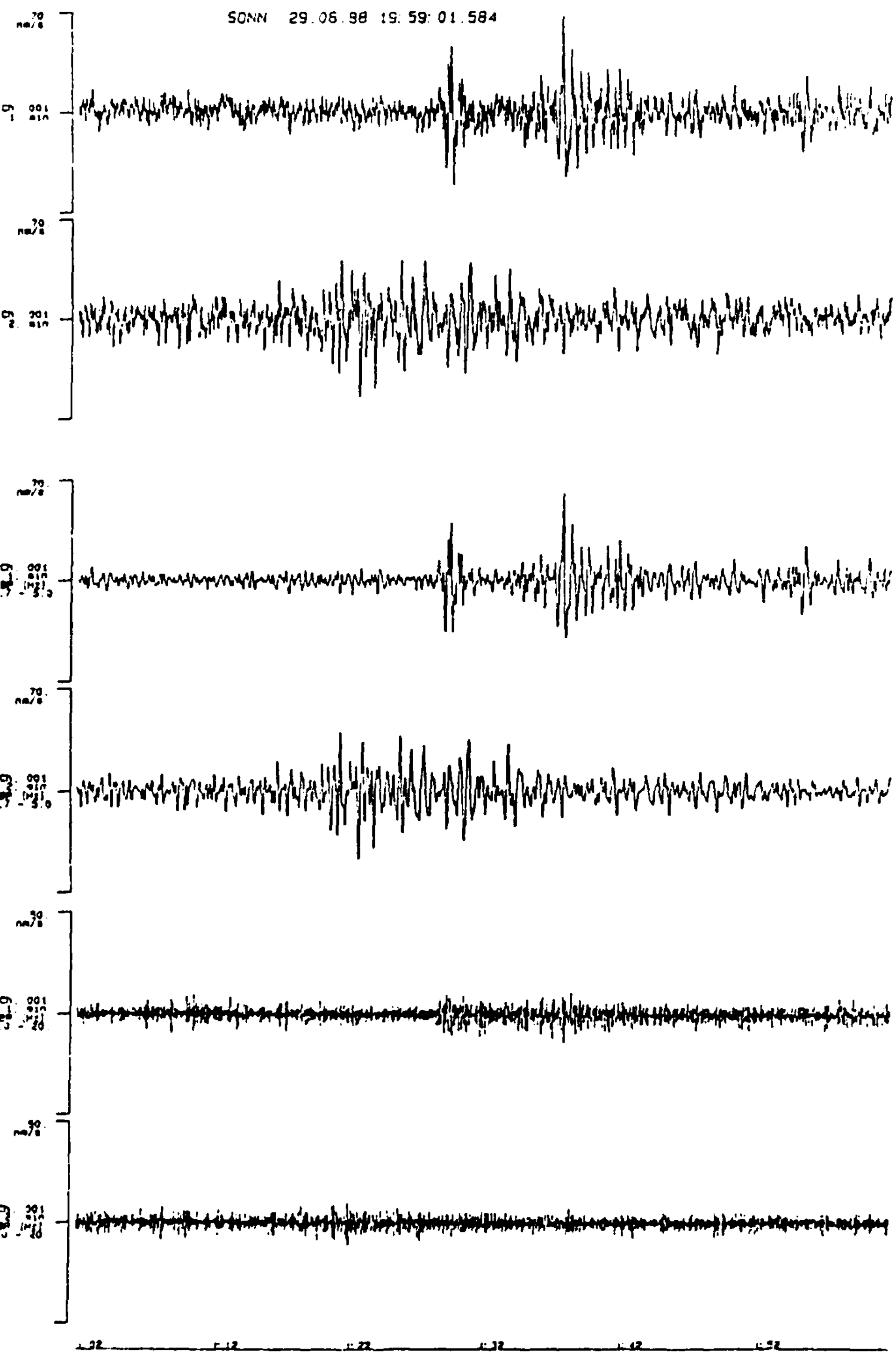


Fig. 4d : Earthquake near Eisenach / GDR : M_L = 2.3, Δ = 328 km
Original Recording (upper two lines), Lowpass (middle) and Highpass (bottom traces) Filtered Seismograms

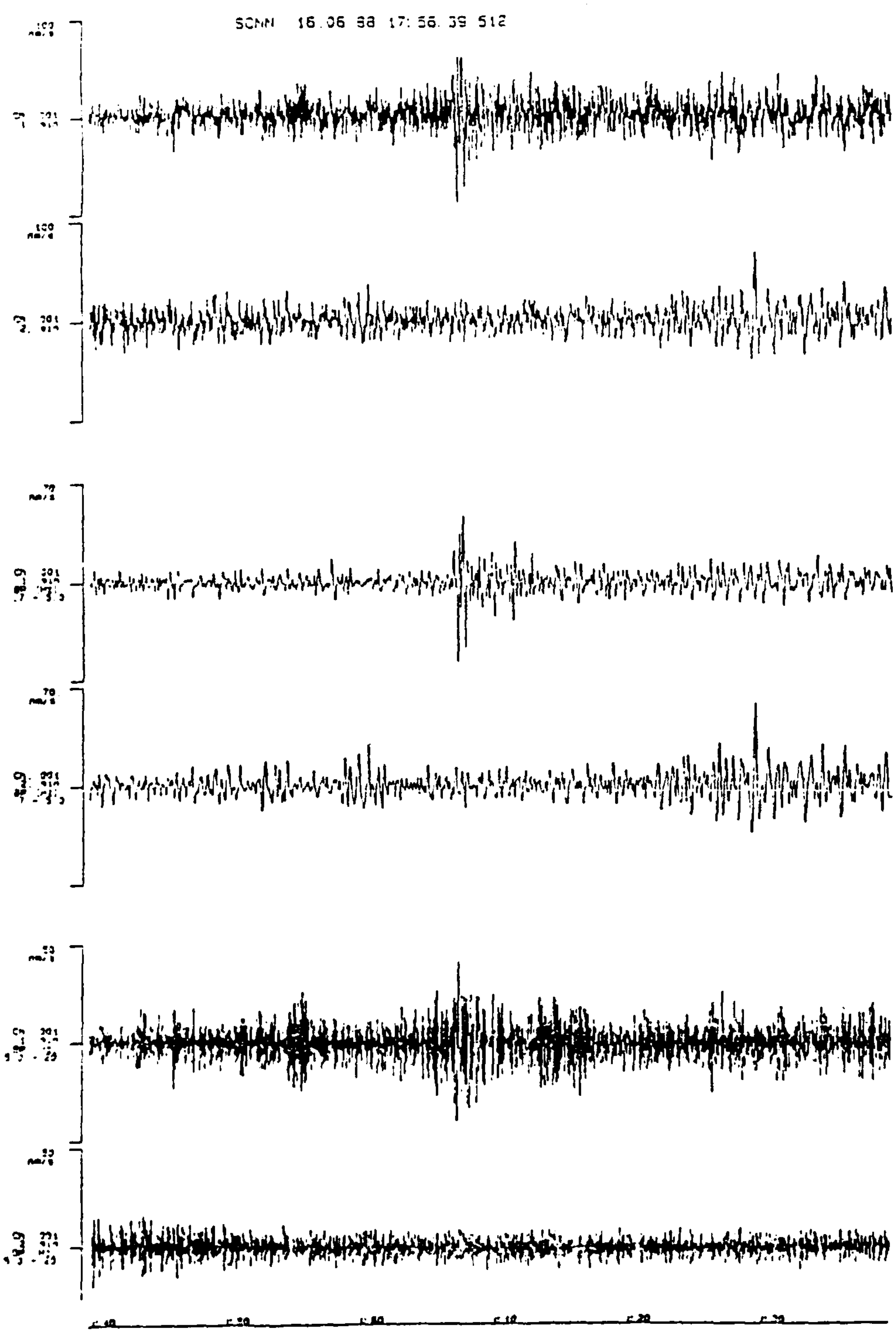


Fig. 4e : Earthquake in France : $M_L = 2.5$, $\Delta = 506$ km
Original Recording (upper two lines), Lowpass (middle)
and Highpass (bottom traces) Filtered Seismograms

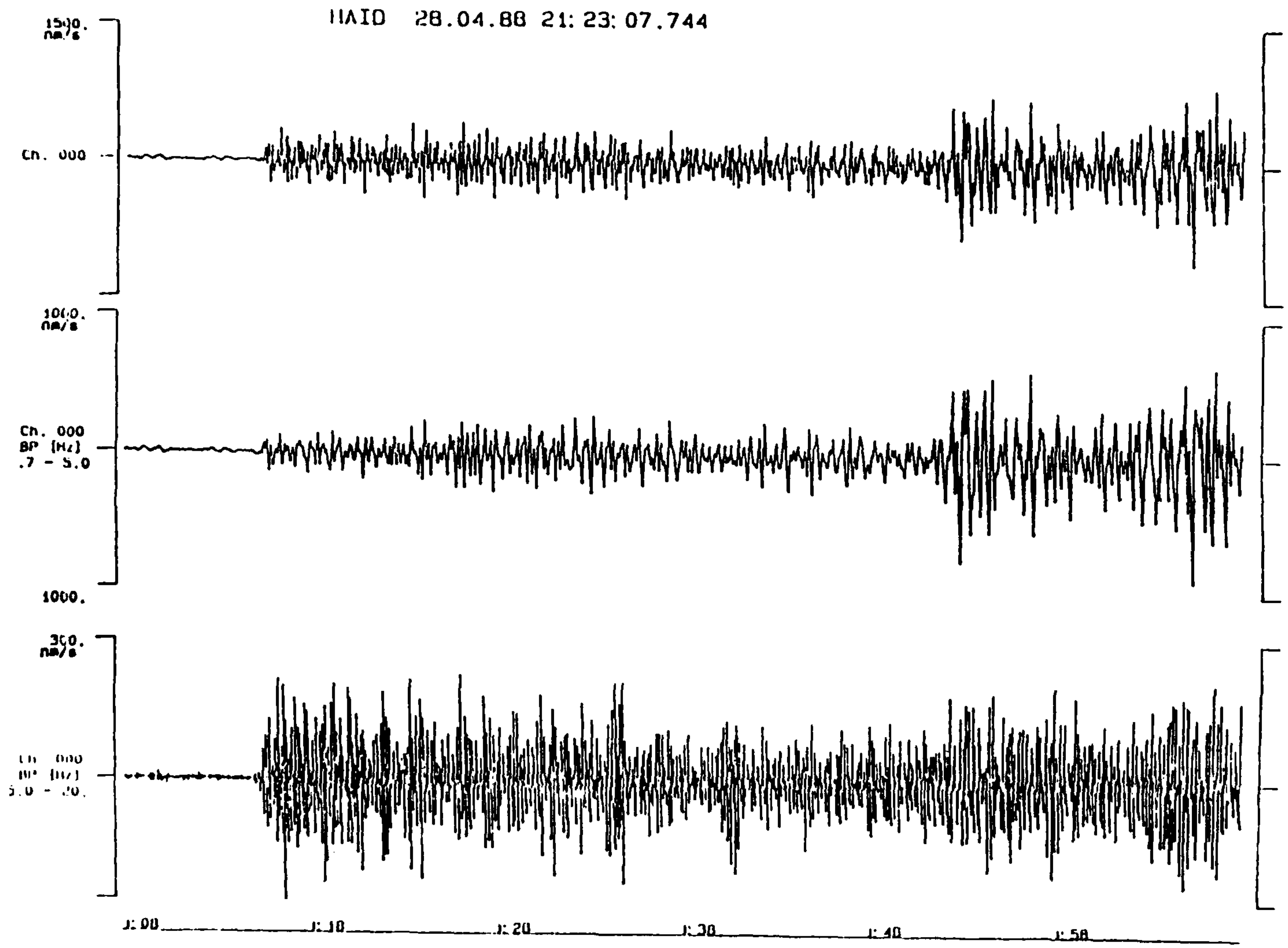


Fig. 4f : CSSR (quarry ?) Event in the West Carpatians : $M_L = 3.3$, $\Delta = 340$ km
Original (top), Lowpass (middle) and Highpass (bottom) Filtered Recording

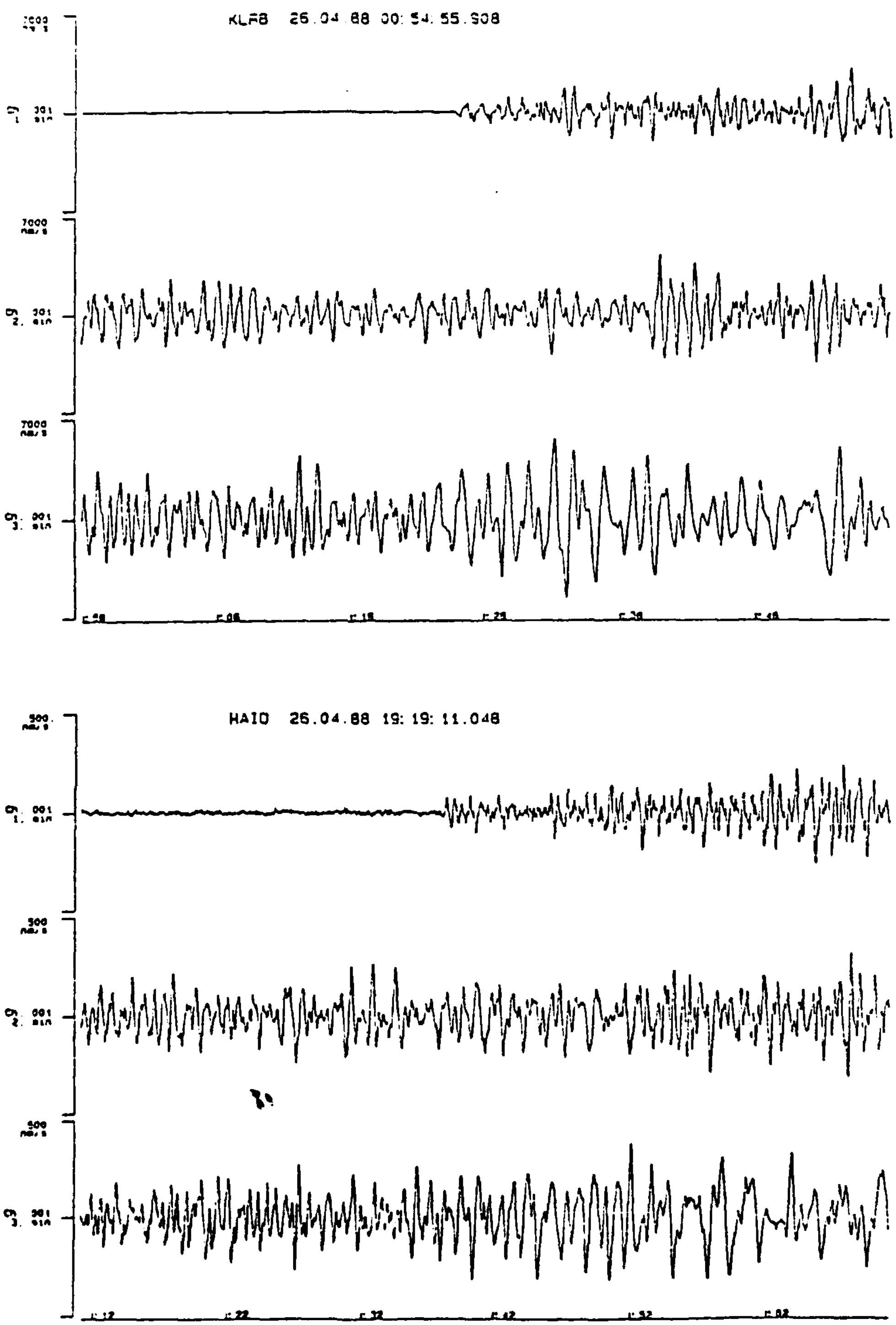


Fig. 4g : Adriatic Sea Earthquakes, Δ = 750 km
Top : Main Shock, m_b = 5.3
Bottom : Aftershock, m_b = 3.8

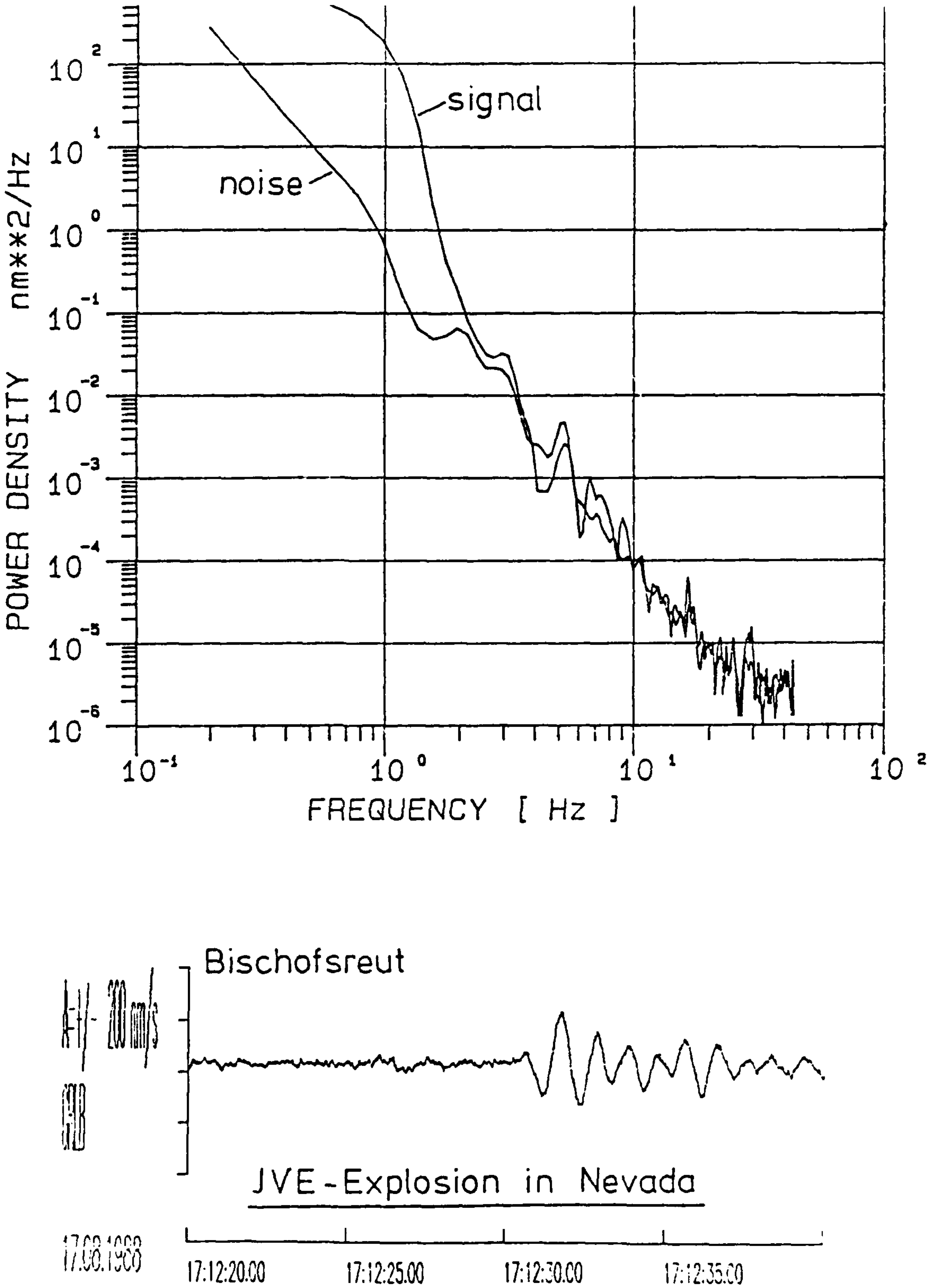


Fig. 4h : P-Wave Recording and Spectral Analysis of Nevada Explosion at proposed GERESS-site

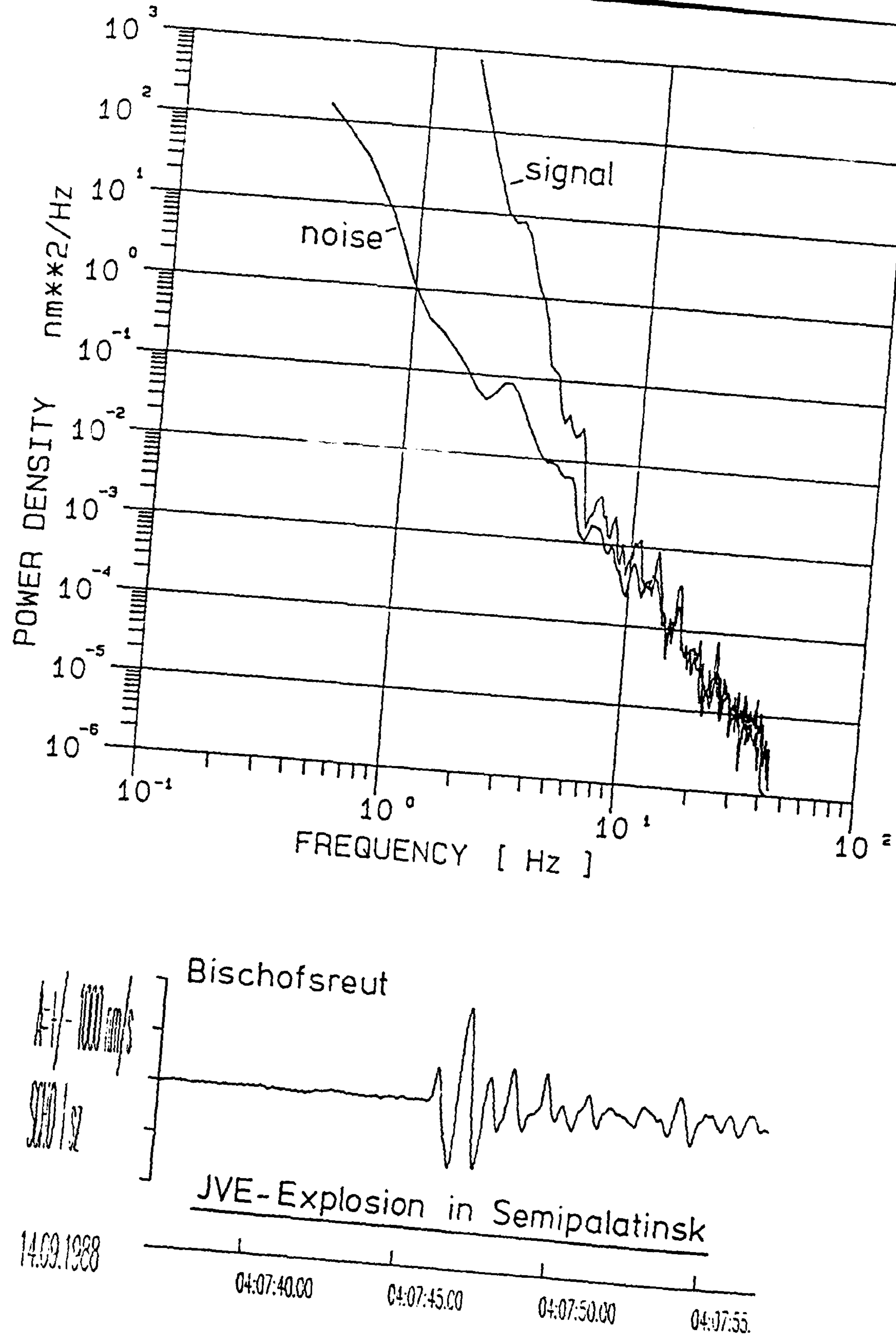


Fig. 4i : P-Wave Recording and Spectral Analysis of Kazakhstan Explosion at proposed GERESS-site

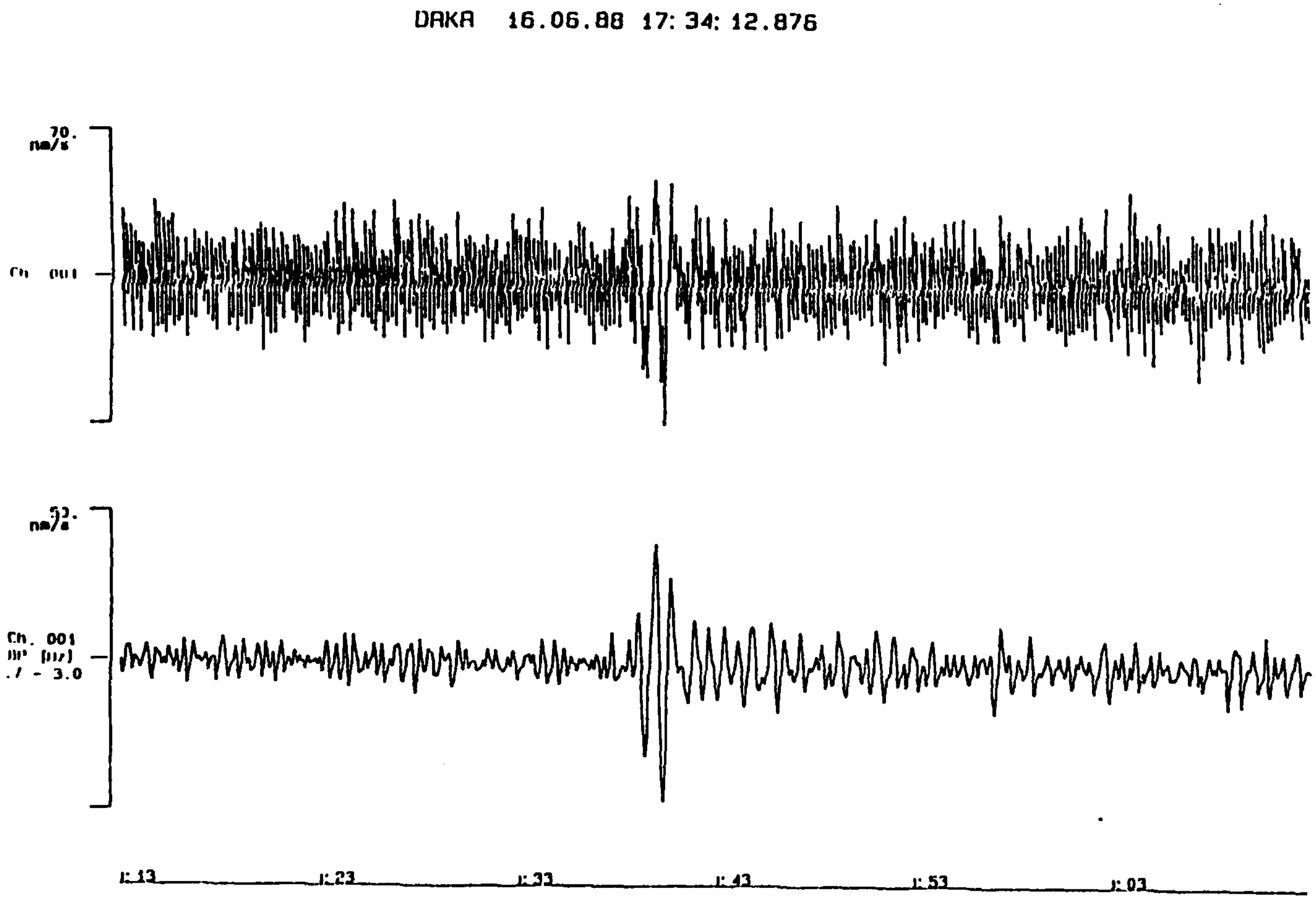


Fig. 4j : PkP-Recording of Small Mururoa Explosion : $\Delta = 145.5°$, A = 9nm, T = 0.9 sec

5. *Future Work*

As a consequence of the noise survey the most promising area for an array installation was found to be the central region of the Bavarian Forest east of the city of Freyung. This area was selected to establish a provisional 9-element array.

Data from this installation will be used to study the coherence of signal and noise which is needed for the array design.

In late 1988 the seismometer vaults were prepared after the German Air Forces were kind enough to allow the use of a building which is ideally suited as a central array station.

It is planned to collect data until May 1989 and after evaluating these data and depending on the results, accurate seismometer sites for the planned regional array will be defined.

6. *Acknowledgements*

This report could not have been written without the support of L. Kuehne, N. Schnieders and D. Wand. Their engaged cooperation during field trip and data analysis is very much appreciated. The station bulletin was produced by B. Modenbach and A. Mueller. I would also like to thank them for their help.

7. *Literature*

Oppenheim, A. V. and R. W. Schafer, *Digital Signal Processing*, p. 585, Prentice Hall Inc., Englewood Cliffs, New Jersey, 1975.

Welch, P. D., "The use of fast fourier transform for the estimation of power spectra : A method based on time averaging over short, modified periodograms", *IEEE Trans. Audio Electroacoust.*, vol. AU-15, pp. 70-73, IEEE, June 1967.

Appendix

EVENT-LIST

PORTABLE SEISMIC STATIONS

07. APR - 05. JUL 1988

date	origin time	epicenter			magnitude
07.04.	21:22:11 KLRB	51.45N	16.09E	(Poland)	ml=3.9
08.04.	04:42:48 KLRB	17.60N	119.4E	(Philippinen)	mb=5.6
08.04.	05:29:23 KLRB	2.0N	121.0E	(Celebes Sea)	mb=5.1
08.04.	05:57:01 KLRB	37.33N	21.15E	(Greece)	mb=3.9
09.04.	18:43:33 KLRB	18.00S	171.00E	(Vanuatu Islands)	mb=4.7
11.04.	03:16:53 KLRB	36.N	69.E	(Hindukusch)	mb=4.1
11.04.	06:30:30 KLRB	17.89S	172.51W	(Tonga Islands)	mb=5.5
12.04.	19:41:13 KLRB	9.2N	65.2W	(Venezuela)	mb=5.7
12.04.	23:19:50 KLRB	21.S	71.W	(South India)	mb=6.6
13.04.	00:02:06 KLRB	51.N	149.W	(Alaska)	mb=5.0
13.04.	00:39:33 KLRB	17.3S	72.6W	(Coast of Peru)	mb=5.3
13.04.	(01:34) KLRB	-----------		(Poland)	ml=3.3
13.04.	10:48:12 KLRB	9.0S	156.0E	(Solomon Islands)	mb=5.0
13.04.	15:34:49 BUCH KLRB	46.06N	15.40E	(Yugoslavia)	mb=3.1
13.04.	20:51:26 BUCH	51.6N	168.7W	(Aleuten)	mb=5.1
13.04.	21:28:29 KLRB BUCH	39.72N	16.88E	(South Italy)	mb=4.9
13.04.	23:01:17 KLRB BUCH	26.S	180.W	(Fiji)	mb=4.3
14.04.	(09:31) BUCH KLRB	-----------		------	------

14.04.	(10:59) BUCH KLRB	-----------	------		------
15.04.	08:51:54 KLRB	16.N	96.W	(Mexico)	mb=5.0
15.04.	09:29:08 KLRB	41.0S	169.0E	(New Zealand)	mb=4.1
15.04.	10:55:43 HAID KLRB	2.S	113.E	(China)	mb=5.6
16.04.	01:08:22 BUCH KLRB HAID	14.29S	173.43W	(Samoa)	mb=5.1
16.04.	(06:49) BUCH HAID KLRB	------------	------		------
16.04.	07:34:00 KLRB HAID BUCH	34.19N	25.09E	(Crete)	mb=4.2
16.04.	08:31:03 BUCH	31.N	140.E	(Japan)	mb=4.5
16.04.	21:16:31 KLRB HAID BUCH	18.S	27.E	(Simbabwe)	mb=5.2
16.04.	21:24:32 HAID	52.N	175.W	(Aleuten)	mb=4.2
16.04.	22:47:17 BUCH	31.N	49.E	(Iran)	mb=4.2
17.04.	02:50:38 HAID	17.5S	72.4W	(Coast of Peru)	mb=5.1
17.04.	03:23:04 KLRB HAID BUCH	20.99S	178.32W	(Fiji Islands)	mb=4.8
17.04.	05:47:58 BUCH	33.N	48.E	(Iran)	mb=4.1
17.04.	09:49:44 BUCH	39.2N	143.5E	(Japan)	mb=4.9
17.04.	09:54:28 BUCH	39.N	143.5E	(Japan)	mb=4.7

17.04.	20:42:56	51.7N	17.8E	(Poland)	ml=3.5
	BUCH				
	KLRB				
	HAID				
18.04.	00:16:40	45.N	152.E	(Kuril Islands)	mb=4.5
	BUCH				
18.04.	(09:15)	------------	------		------
	BUCH				
	HAID				
	KLRB				
18.04.	(11:06)	------------	------		------
	BUCH				
	HAID				
	KLRB				
18.04.	(12:17)	------------	------		------
	HAID				
	KLRB				
	BUCH				
18.04.	(12:41)	------------	------		------
	BUCH				
	KLRB				
	HAID				
18.04.	17:13:30	24.9S	177.4W	(Fiji Islands)	mb=5.1
	BUCH				
	HAID				
18.04.	18:35:08	46.02N	12.25E	(Northern Italy)	ml=3.8
	KLRB				
	HAID				
	BUCH				
18.04.	19:25:43	34.N	72.E	(Pakistan)	mb=3.9
	BUCH				
18.04.	20:37:24	44.N	154.E	(Kuril Islands)	mb=4.4
	BUCH				
18.04.	22:00:21	34.83N	25.81E	(Crete)	mb=4.3
	KLRB				
	HAID				
19.04.	(01:19)	------------	------		------
	HAID				
	KLRB				
	BUCH				
19.04.	01:56:41	44.N	142.E	(Japan)	mb=4.9
	BUCH				
	KLRB				
	HAID				
19.04.	05:54:01	19.N	141.E	(Mariana Islands)	mb=5.5
	BUCH				
	HAID				

19.04.	(09:29)	------------	------		------
	HAID				
	KLRB				
	BUCH				
19.04.	(09:59)	------------	------		------
	BUCH				
	HAID				
	KLRB				
19.04.	(11:05)	------------	------		------
	HAID				
	KLRB				
	BUCH				
19.04.	(12:02)	------------	------		------
	HAID				
	BUCH				
	KLRB				
19.04.	(15:00)	------------	------		------
	BUCH				
	HAID				
	KLRB				
19.04.	19:10:52	5.N	127.E	(Talaud Islands)	mb=5.6
	KLRB				
19.04.	20:48:54	2.0N	127.3E	(Molucca Passage)	mb=5.7
	KLRB				
19.04.	20:56:24	34.20N	104.38E	(China)	mb=5.3
	KLRB				
	BUCH				
19.04.	22:04:50	54.7N	152.W	(Alaska)	mb=5.1
	BUCH				
	HAID				
	KLRB				
20.04.	03:50:10	35.4N	39.4E	(Iran)	mb=5.7
	KLRB				
	HAID				
	BUCH				
20.04.	04:25:36	0.95N	30.24W	(Mid-Atlantic)	mb=5.7
	BUCH				
	KLRB				
	HAID				
20.04.	06:40:50	29.N	83.E	(Bengalen)	mb=5.3
	BUCH				
	HAID				
20.04.	08:03:11	16.7S	177.24W	(Fiji Islands)	mb=5.0
	BUCH				

20.04.	(08:50)	------------		------	------
	HAID				
	KLRB				
	BUCH				
20.04.	(09:25)	------------		------	------
	KLRB				
	BUCH				
	HAID				
20.04.	(09:59)	------------		(Taiwan)	------
	KLRB				
	BUCH				
	HAID				
20.04.	10:27:29	26.N	131.E	(Ryukyu Islands)	mb=5.1
	BUCH				
	HAID				
	KLRB				
20.04.	10:27:43	28.17N	130.0E	(Ryukyu Islands)	mb=5.2
	BUCH				
20.04.	(11:42)	------------		------	------
	HAID				
	KLRB				
	BUCH				
20.04.	18:15:43	49.19N	6.87E	(Germany,Saarland)	------
	KLRB				
21.04.	10:01:51	39.17N	44.16E	(Central USSR)	mb=4.6
	BUCH				
21.04.	(11:44)	------------		------	------
	BUCH				
	KLRB				
	HAID				
21.04.	(12:45)	------------		------	ml=3.5
	BUCH				
	HAID				
21.04.	18:28:01	43.9N	149.9E	(North Pacific)	mb=5.3
	HAID				
	BUCH				
22.04.	01:54:25	32.N	48.E	(Iran)	mb=4.7
	HAID				
22.04.	(07:53)	------------		------	------
	HAID				
	KLRB				
	BUCH				
22.04.	(09:32)	------------		------	------
	BUCH				
	HAID				
	KLRB				

22.04.	(10:01)	------------	------		------
	BUCH				
	HAID				
	KLRB				
22.04.	(11:05)	------------	------		------
	BUCH				
	HAID				
	KLRB				
23.04.	(12:11)	------------	------		------
	HAID				
24.04.	10:10:35	38.88N	20.52E	(Mediterranean Sea)	mb=4.2
	HAID				
	KLRB				
24.04.	15:48:06	0.N	31.W	(Mid-Atlantic Ridge)	mb=4.5
	KLRB				
24.04.	20:03:22	22.3N	122.4E	(Taiwan)	mb=5.7
	HAID				
	KLRB				
	BUCH				
24.04.	20:49:36	40.85N	28.24E	(Turkey)	mb=4.5
	HAID				
	KLRB				
	BUCH				
25.04.	00:41:56	51.49N	15.99E	(Poland)	ml=3.6
	HAID				
	KLRB				
25.04.	01:18:54	33.S	177.E	(Fiji Islands)	mb=4.6
	HAID				
	KLRB				
	BUCH				
25.04.	(07:52)	------------	------		------
	KLRB				
	HAID				
	BUCH				
25.04.	10:10:31	78.0S	158.E	(Solomon Islands)	mb=6.0
	KLRB				
	HAID				
	BUCH				
25.04.	(10:46)	------------	------		------
	HAID				
	KLRB				
	BUCH				
25.04.	(11:17)	------------	------		------
	BUCH				
	HAID				
	KLRB				

25.04.	(12:29) HAID KLRB BUCH	------------	------		------
25.04.	12:59:13 HAID	1.7N	126.5E	(Molucca Passage)	mb=5.1
25.04.	(13:33) HAID KLRB BUCH	------------	------		------
25.04.	16:13:50 KLRB	22.N	66.E	(Pakistan)	mb=4.0
25.04.	17:40:02 KLRB	36.N	72.E	(Afghanistan)	mb=4.7
25.04.	18:53:39 KLRB	8.0S	159.0E	(Solomon Islands)	mb=4.6
25.04.	20:11:00 HAID	72.0N	10.0E	(Greenland)	mb=4.7
26.04.	00:43:43 HAID	54.0S	33.0W	(South Georgia)	mb=5.2
26.04.	00:53:45 KLRB HAID	42.34N	16.59E	(Adriatic Sea)	mb=5.3
26.04.	01:42:55 KLRB	22.0N	107.0W	(Coast of Mexico)	mb=5.3
26.04.	02:31:29 KLRB	42.32N	16.5E	(Adriatic Sea)	ml=3.8
26.04.	03:49:43 KLRB	33.0S	180.0W	(Kermadec Islands)	mb=4.1
26.04.	(07:53) KLRB HAID BUCH	------------	------		------
26.04.	(08:25) HAID KLRB BUCH	------------	------		------
26.04.	(10:06) HAID KLRB BUCH	------------		(Poland)	------
26.04.	15:57:54 HAID BUCH	51.27N	15.97E	(Poland)	------

26.04.	19:17:58	42.22N	16.56E(Meditrranean Sea)	mb=3.8
	KLRB			
	HAID			
27.04.	00:52:07	55.56N	4.71E(North Sea)	------
	HAID			
27.04.	(07:53)	------------	------	------
	KLRB			
	HAID			
	BUCH			
27.04.	(09:57)	------------	------	------
	BUCH			
	HAID			
	KLRB			
27.04.	(10:06)	------------	------	------
	HAID			
	BUCH			
	KLRB			
27.04.	15:29:37	8.0N	92.0W (Cent. America)	mb=4.3
	HAID			
28.04.	10:18:51	78.52N	7.35E(Greenland)	mb=4.6
	BUCH			
	HAID			
28.04.	21:02:40	41.0N	146.0E (Japan)	mb=4.3
	HAID			
28.04.	21:22:27	48.94N	18.36E(CSSR)	mb=3.3
	HAID			
	BUCH			
28.04.	22:40:37	25.0S	179.0E (Fiji Islands)	mb=4.2
	BUCH			
	HAID			
28.04.	22:41:08	18.0S	178.5W (Fiji Islands)	mb=5.3
	BUCH			
29.04.	04:37:47	51.44N	16.0E (Poland)	ml=3.7
	HAID			
29.04.	07:36:06	34.0S	174.0E (Kermadec Islands)	mb=4.7
	BUCH			
30.04.	06:50:02	21.0S	171.0E (Loyalty Islands)	mb=4.9
	BUCH			
	HAID			
30.04.	13:25:05	51.75N	16.16E(Poland)	mb=3.4
	BUCH			
	HAID			
30.04.	16:32:56	51.54N	16.06E(Poland)	ml=3.3
	HAID			
	BUCH			

30.04.	19:46:26	32.0S	175.0W (Fiji Islands)	mb=3.5
	BUCH			
	HAID			
01.05.	02:58:01	44.63N	10.34E (Northern Italy)	ml=3.4
	HAID			
01.05.	05:41:22	24.0S	170.0E (Loyalty Islands)	mb=4.1
	HAID			
01.05.	10:06:52	51.7N	162.4E (Kuril Islands)	mb=5.6
	BUCH			
	HAID			
01.05.	15:21:27	27.0S	171.0E (Santa Cruz)	mb=5.4
	HAID			
	BUCH			
01.05.	15:42:38	47.0N	173.0W (Aleutian Islands)	mb=3.9
	HAID			
01.05.	18:01:16	51.67N	16.40E (Poland)	ml=3.5
	BUCH			
01.05.	19:30:49	49.0N	156.0E (Kuril Islands)	mb=3.7
	HAID			
02.05.	02:13:46	41.0N	80.0E (China)	mb=5.1
	HAID			
02.05.	12:27:58	44.1N	10.8E (Northern Italy)	ml=3.7
	BUCH			
03.05.	07:31:34	1.0S	96.0E (Sumatera)	mb=4.5
	HAID			
	BUCH			
03.05.	08:41:31	43.63N	47.59E (Eastern Caucasus)	mb=4.6
	HAID			
03.05.	08:53:44	32.27N	49.92E (Western Iran)	mb=4.8
	BUCH			
03.05.	09:15:29	42.47N	47.56E (Eastern Caucasus)	mb=5.1
	HAID			
	BUCH			
03.05.	10:07:36	39.0N	46.0E (Iran-USSR)	mb=4.2
	HAID			
03.05.	10:35:07	18.0N	116.0E (South China)	mb=4.0
	BUCH			
03.05.	20:27:55	41.0N	150.0E (Kuril Islands)	mb=5.5
	BUCH			
	HAID			
03.05.	23:22:09	18.0S	175.0E (Loyalty Islands)	mb=5.6
	BUCH			
	HAID			

04.05.	00:57:07 HAID BUCH	50.0N	79.0E	(Semipalatinsk)	mb=6.1
04.05.	02:53:24 BUCH HAID	26.0S	179.0W	(South of Fiji)	mb=3.5
04.05.	07:21:37 BUCH HAID	29.0S	179.0W	(Kermadec Islands)	mb=4.2
04.05.	17:59:59 HAID	17.2S	179.4W	(Fiji Islands)	mb=4.7
05.05.	00:03:21 HAID	2.7S	140.0E	(Western Irian)	mb=5.3
05.05.	00:03:21 BUCH HAID	2.7S	140.6E	(Western Irian)	mb=5.3
05.05.	02:50:23 BUCH HAID	45.0N	151.0E	(Kuril Islands)	mb=4.5
05.05.	10:04:18 BUCH HAID	26.0S	116.0W	(Easter Island)	mb=5.6
05.05.	20:46:07 BUCH HAID	51.5N	16.08E	(Poland)	ml=3.9
05.05.	20:51:08 HAID BUCH	7.0S	98.0E	(Sumatera)	mb=5.0
05.05.	22:32:52 BUCH	22.0S	123.0W	(Easter Island)	mb=4.9
05.05.	23:34:57 HAID	55.0S	140.0E	(Macquarie Islands)	mb=4.4
06.05.	05:47:46 BUCH HAID	21.07S	173.9W	(Tonga Islands)	mb=5.2
06.05.	09:23:33 HAID BUCH	12.6N	94.2E	(Nicobar Islands)	mb=5.3
06.05.	09:31:04 HAID	17.0N	91.0W	(Bay of Bengalen)	mb=4.3
06.05.	12:18:50 BUCH	36.94N	29.66E	(Turkey)	mb=4.4

06.05.	14:46:21 BUCH	12.0N 83.0W	(Nicaragua)	mb=5.7
06.05.	16:34:45 BUCH	5.0S 73.0W	(Peru-Brazil)	mb=5.6
07.05.	00:54:18 BUCH	45.7N 151.8E	(Kuril Islands)	mb=5.5
07.05.	00:57:17 BUCH	45.7N 151.8E	(Kuril Islands)	mb=5.4
07.05.	01:22:20 BUCH	45.7N 151.8E	(Kuril Islands)	mb=5.4
07.05.	01:30:20 BUCH	35.0S 178.0W	(New Zealand)	mb=4.4
11.05.	16:59:59 BUCH HAID	22.0S 139.0W	(Mururoa)	mb=4.7
11.05.	18:57:29 BUCH	0.0N 121.0E	(Alaska)	mb=4.8
11.05.	19:55:59 BUCH	21.0S 179.0W	(Fiji Islands)	mb=5.0
11.05.	20:47:45 BUCH	12.0N 120.0E	(Philippine Islands)	mb=4.8
11.05.	23:03:54 BUCH	11.0N 89.0E	(Bay of Bengal)	mb=3.9
11.05.	(23:34) BUCH	------------	------	------
12.05.	02:42:35 BUCH	56.0N 161.0W	(Alaska)	mb=4.8
12.05.	02:45:49 BUCH	28.0N 88.0E	(Tibet)	mb=3.8
12.05.	12:56:23 HAID	32.0N 77.0E	(Northern India)	mb=4.2
12.05.	13:14:34 HAID	32.0S 177.0W	(Kermadec Islands)	mb=3.8
13.05.	04:44:39 HAID	15.35S 175.02W	(Tonga Islands)	mb=5.7
13.05.	14:28:46 HAID	9.0N 31.0W	(North Atlantic)	mb=4.2
14.05.	01:13:26 HAID BUCH	50.38N 18.88E	(Poland)	ml=3.1

14.05.	11:11:35	48.0N	155.0E	(Kuril Islands)	mb=4.3
	BUCH				
	HAID				
14.05.	15:33:07	24.0S	168.0E	(New Caledonia)	mb=4.5
	BUCH				
14.05.	(19:56)	51.6N	16.7E	(Poland)	ml=3.3
	HAID				
	BUCH				
15.05.	08:21:36	40.0N	150.0E	(North Pacific)	mb=5.7
	BUCH				
	HAID				
16.05.	13:53:14	44.0N	155.0E	(North Pacific)	mb=4.3
	BUCH				
16.05.	23:07:49	14.0S	164.0E	(Vanuatu Islands)	mb=5.7
	BUCH				
	HAID				
17.05.	02:45:07	19.0N	88.0W	(Yucatan Penins.)	mb=4.7
	HAID				
18.05.	03:58:47	26.0S	129.0W	(South of Fiji)	mb=3.9
	BUCH				
	HAID				
18.05.	05:17:43	39.0N	22.0E	(Greece)	mb=5.5
	HAID				
	BUCH				
18.05.	05:40:18	16.0N	42.0W	(North Atlantic)	mb=5.4
	BUCH				
	HAID				
18.05.	05:44:44	13.54N	44.87W	(North Atlantic)	mb=5.2
	BUCH				
	HAID				
18.05.	06:13:42	52.0N	176.0E	(Aleuten)	mb=5.4
	BUCH				
	HAID				
18.05.	07:59:49	45.0N	140.0E	(Eastcoast USSR)	mb=4.8
	HAID				
	BUCH				
18.05.	(10:00)	------------	------		------
	BUCH				
	HAID				
19.05.	03:22:29	20.0S	180.0E	(Fiji Islands)	mb=5.2
	HAID				
19.05.	18:32:33	34.0S	174.0W	(S. of Kermadec I.)	mb=4.0
	BUCH				
20.05.	03:19:47	17.0S	72.0W	(Peru)	mb=4.8
	HAID				

20.05.	09:17:26 HAID	15.17S	173.95W(Tonga Islands)	mb=5.3
20.05.	14:59:47 BUCH HAID	16.0N	36.0W (Mid Atlantic)	mb=5.9
21.05.	00:08:22 HAID	5.0S	95.0E (Sumtera)	mb=4.8
21.05.	(15:24) HAID	------------	------	------
21.05.	15:16:18 BUCH	4.0N	27.0W (North Atlantic)	mb=5.4
21.05.	15:16:21 HAID	20.24S	173.68W (Tonga Islands)	mb=5.2
22.05.	03:44:16 HAID BUCH	38.37N	20.52E(Greece)	mb=5.0
22.05.	09:39:55 BUCH HAID	53.6N	163.9W (Unimak Islands)	mb=5.7
22.05.	12:51:24 HAID BUCH	24.0N	51.0W (North Atlantic)	mb=4.5
22.05.	19:17:57 BUCH HAID	58.0N	150.0W (Golf of Alaska)	mb=4.7
23.05.	07:45:17 BUCH HAID	32.0S	180.0E (Kermadec Islands)	mb=3.6
23.05.	16:39:01 BUCH HAID	37.0S	175.0E (New Zealand)	mb=4.0
23.05.	18:50:54 BUCH	51.4N	160.9E (Kamchatka)	mb=4.9
23.05.	22:54:33 BUCH HAID	13.0S	141.0E (Queensland)	mb=4.7
24.05.	[illegible] BUCH	25.0S	174.0W (S. of Tonga I.)	mb=3.8
24.05.	19:30:32 HAID	51.14N	15.96E(Poland)	ml=3.2
24.05.	21:39:59 HAID BUCH	19.96S	168.65E(Vanuatu Islands)	mb=5.0

24.05.	22:27:51 HAID BUCH	20.5S	168.7E (Loyalty Islands)	mb=4.4
25.05.	10:11:10 HAID	37.0N	22.0E (Southern Greece)	mb=3.8
25.05.	13:33:36 BUCH	31.0N	124.0E (East of China)	mb=4.5
25.05.	14:05:17 HAID	50.6N	173.4W (Aleuten)	mb=6.0
25.05.	17:01:00 BUCH HAID	22.0S	139.0W (Mururoa)	mb=5.1
25.05.	18:22:35 HAID BUCH	46.0N	82.0E (China)	mb=5.0
26.05.	10:04:32 BUCH HAID	2.0S	102.0E (Sumatera)	mb=4.7
26.05.	(17:02) HAID BUCH	------------	(Poland)	ml=3.2
26.05.	18:55:25 HAID BUCH	51.47N	16.17E(Poland)	ml=3.9
26.05.	19:01:26 BUCH HAID	47.0N	129.0W (Vancouver Islands)	mb=5.1
27.05.	(01:41) BUCH HAID	------------	------	------
27.05.	02:44:22 HAID	25.03S	177.0W(Fiji Islands)	mb=5.2
27.05.	14:18:38 BUCH	44.13N	26.60E (Yugoslavia)	mb=4.4
28.05.	07:57:39 BUCH GRLB	20.45S	178.94W (Fiji Islands)	mb=4.7

28.05. 10:06:04 BUCH GRLB	51.42N	16.32E(Poland,Lubin)	mb=3.6
28.05. 10:24:38 GRLB	31.9S	111.37W(Easter Islands)	mb=5.1
28.05. 16:26:46 BUCH GRLB GRFB5	26.0S	180.0W (Fiji)	mb=4.8
28.05. 19:42:06 GRLB	7.0N	95.0E (Nicobar Islands)	mb=4.2
29.05. 06:24:22 GRLB BUCH	16.8S	172.5W (Samoa Islands)	mb=5.2
29.05. (23:38) GRLB	------------	------	------
30.05. 00:26:13 BUCH	28.78N	51.21E(South of Iran)	mb=4.4
30.05 (10:21) GRFB5 BUCH GRLB	-------------	------	------
30.05. 10:45:20 BUCH	38.0N	139.0E (Japan)	mb=5.1
30.05. 16:47:03 BUCH	40.29N	25.93E(North Aegaeis)	mb=3.9
30.05. 18:00:55 GRLB BUCH GRFB5	33.0N	89.0E (Tibet)	mb=4.7
30.05. 19:36:48 GRFB5 GRLB	43.14N	13.96E(Italy)	ml=3.6
30.05. 21:11:13 GRLB BUCH GRFB5	9.0S	124.0E (Banda Sea)	mb=7.3
30.05. 21:22:14 BUCH	31.7S	69.1W (Prov.Argentina)	mb=5.9
31.05. (11:45) GRLB BUCH GRFB5	------------	------	------

31.05.	14:20:32	20.2S	168.5E	(Loyalty Islands)	mb=4.8
	BUCH				
	GRLB				
	GRFB5				
31.05.	18:51:36	20.5S	176.0W	(Tonga Islands)	mb=5.2
	BUCH				
	GRFB5				
	GRLB				
01.06.	00:04:31	50.9N	14.8E	(Czechoslovakia)	------
	GRLB				
01.06.	06:31:22	66.9W	33.0N	(South Bolivia)	------
	BUCH				
01.06.	07:41:16	71.5W	33.0N	(Chile)	mb=5.0
	GRLB				
	BUCH				
01.06.	16:55:28	32.9S	72.1W	(West Chile)	------
	BUCH				
02.06.	09:47:14	45.8N	27.3E	(Romania)	------
	BUCH				
02.06.	11:58:49	36.6S	179.1E	(New Zealand)	mb=5.5
	BUCH				
	GRLB				
02.06.	13:00:00	37.2N	116.4W	(Nevada Test Site)	mb=5.4
	BUCH				
	GRLB				
02.06.	13:31:24	18.3S	174.6W	(Tonga Islands)	mb=5.0
	BUCH				
02.06.	13:48:21	52.4N	170.6W	(Aleutian)	mb=4.8
	GRLB				
03.06.	01:13:47	19.8S	177.8W	(Fiji Islands)	mb=4.8
	BUCH				
	GRLB				
	SONN				
03.06.	05:49:59	36.5N	71.5E	(Afghanistan Border)	mb=5.0
	SONN				
	GRLB				
	BUCH				
03.06.	(10:18)	------------		(CSSR,Bruenn)	------
	BUCH				
	GRLB				
	SONN				
03.06.	(10:30)	------------		(CSSR,Pilsen)	------
	GRLB				
	BUCH				
	SONN				

03.06.	15:39:23	53.1N	170.3W	(Aleutian)	mb=5.1
	BUCH				
	GRLB				
	SONN				
03.06.	18:26:07	36.2N	70.6E	(Hindukush Region)	mb=4.9
	SONN				
	GRLB				
	BUCH				
03.06.	23:27:34	45.0S	167.5E	(New Zealand)	mb=6.0
	SONN				
	GRLB				
	BUCH				
04.06.	03:09:00	36.9N	45.2E	(Northwestern Iran)	mb=4.8
	SONN				
	GRLB				
	BUCH				
04.06.	07:24:21	55.8N	113.0E	(East of Lake Baikal)	mb=4.7
	BUCH				
04.06.	(11:06)	-------------		------	------
	BUCH				
	GRLB				
	SONN				
04.06.	14:31:16	24.8N	126.7E	(Ryukyu Islands)	mb=4.5
	GRLB				
	SONN				
05.06.	01:41:33	21.5S	178.3W	(Fiji Islands)	mb=5.0
	BUCH				
	GRLB				
	SONN				
05.06.	08:19:05	49.1N	128.2W	(Washington)	mb=4.7
	GRLB				
	SONN				
05.06.	08:56:13	39.4N	142.2E	(Japan, Honshu)	mb=4.8
	BUCH				
05.06.	(10:32)	-------------		-------	------
	GRLB				
	BUCH				
	SONN				
05.06.	18:22:49	15.4S	167.6E	(Vanuatu Islands)	mb=5.9
	GRLB				
	BUCH				
	SONN				
05.06.	18:26:58	27.9N	33.8E	(Egypt)	mb=4.3
	SONN				
	GRLB				
05.06.	21:42:53	32.0S	177.0W	(Kermadec Islands)	mb=3.8
	GRLB				

05.06.	21:46:56	25.6N	142.6E	(Vocano Islands)	mb=4.9
	GRLB				
06.06.	05:33:37	27.0N	56.0E	(Iran)	mb=4.0
	GRLB				
06.06.	05:57:41	38.3N	20.4E	(Greece)	mb=4.8
	GRLB				
06.06.	08:42:02	29.8N	51.1E	(Iran/Irak)	mb=4.9
	GRLB				
	BUCH				
06.06.	09:55:21	53.3N	35.2W	(North Atlantic)	mb=4.8
	GRLB				
	SONN				
06.06.	10:43:51	20.3S	173.8W	(Tonga Islands)	mb=5.1
	BUCH				
	GRLB				
06.06.	(11:09)	------------	------		------
	BUCH				
	GRLB				
	SONN				
06.06.	13:22:02	38.3N	20.5E	(Greece)	mb=3.8
	BUCH				
	GRLB				
	SONN				
06.06.	15:01:26	59.1N	137.8W	(Alaska)	mb=5.0
	BUCH				
06.06.	17:28:45	29.0N	94.8E	(China)	mb=4.7
	GRLB				
	SONN				
06.06.	(19:16)	------------	------		------
	BUCH				
	SONN				
07.06.	(07:53)	------------	------		------
	SONN				
	GRLB				
	BUCH				
07.06.	(08:55)	------------	------		------
	GRLB				
	SONN				
	BUCH				
07.06.	(09:28)	------------	------		------
	GRLB				
	SONN				
	BUCH				

07.06.	(11:06)	------------	------		------
	BUCH				
	GRLB				
	SONN				
07.06.	(11:34)	------------	------		------
	BUCH				
	GRLB				
	SONN				
07.06.	11:46:34	44.4N	11.0E	(Northern Italy)	mb=3.2
	BUCH				
07.06.	(12:46)	------------	------		------
	BUCH				
	GRLB				
	SONN				
07.06.	14:25:28	7.2S	120.5E	(Banda Sea)	mb=5.1
	BUCH				
08.06.	02:15:54	38.0N	81.0E	(China)	mb=4.0
	GRLB				
08.06.	(07:01)	------------	------		------
	BUCH				
	GRLB				
	SONN				
08.06.	(09:07)	------------	------		------
	BUCH				
	GRLB				
	SONN				
08.06.	(09:13)	------------	------		------
	BUCH				
	GRLB				
	SONN				
08.06.	(10:11)	------------	------		------
	GRLB				
	SONN				
	BUCH				
08.06.	(10:17)	------------	------		------
	BUCH				
	GRLB				
	SONN				
08.06.	(10:47)	------------	------		------
	BUCH				
	GRLB				
	SONN				
09.06.	00:09:50	28.5N	56.8E	(Southern Iran)	mb=5.0
	SONN				
09.06.	02:18:25	32.2N	28.0E	(E.Mediterranean Sea)	mb=4.7
	SONN				

09.06.	10:13:34 SONN	39.0N	96.0E	(China)	mb=3.8
09.06.	14:56:23 SONN	15.0N	98.5W	(Mexico)	mb=4.6
09.06.	21:56:08 SONN	53.5N	35.4W	(Noth Atlantic Ridge)	mb=4.6
10.06.	03:10:21 BUCH	12.7S	166.8E	(Santa Cruz Islands)	mb=5.7
10.06.	05:06:47 BUCH	13.9N	51.7E	(Golf of Aden)	mb=4.7
10.06.	(10:37) BUCH GRLB SONN	------------		(Germany,Erzgebirge)	------
10.06.	10:48:07 BUCH GRLB SONN	6.8S	131.1E	(Tanimber Islands)	------
10.06.	11:31:52 BUCH SONN GRLB	6.9S	72.2E	(Chagos Archipelago)	mb=5.5
10.06.	14:15:52 SONN GRLB BUCH	4.9S	151.8E	(New Britain Region)	------
10.06.	(14:37) SONN GRLB BUCH	------------		------	------
10.06.	21:11:16 GRLB BUCH	39.2N	71.5E	(Tajik SSR)	mb=4.8
11.06.	00:47:15 BUCH GRLB	51.3N	16.0E	(Poland,Lubin)	ml=3.6
11.06.	02:50:02 BUCH GRLB	5.9S	151.2E	(New Britain)	mb=5.2
11.06.	04:45:55 BUCH	6.1S	151.3E	(New Britain)	mb=4.8
11.06.	12:17:28 BUCH GRLB SONN	16.0S	180.0W	(Tonga Islands)	mb=5.9

11.06.	19:31:00	18.5S	175.6W	(Tonga Islands)	mb=5.1
	BUCH				
	GRLB				
	SONN				
11.06.	22:44:46	45.9N	6.8E	(Northern Italy)	ml=3.2
	SONN				
	GRLB				
12.06.	00:47:21	44.7N	149.6E	(Kuril Islands)	mb=4.8
	GRLB				
	BUCH				
12.06.	01:03:55	51.4N	169.0W	(Aleutian Islands)	mb=4.9
	GRLB				
12.06.	03:09:44	33.4N	138.2E	(Japan,Honshu)	mb=4.6
	BUCH				
	GRLB				
	SONN				
12.06.	04:17:57	46.2N	16.5E	(Yugoslavia)	ml=3.6
	SONN				
	GRLB				
	BUCH				
12.06.	07:18:47	38.3N	55.3E	(Iran)	mb=5.5
	GRLB				
	BUCH				
12.06.	(08:03)	------------	------		------
	SONN				
	GRLB				
	BUCH				
12.06.	(08:27)	-------------	------		------
	BUCH				
	GRLB				
	SONN				
12.06.	08:56:14	34.7N	24.3E	(Crete)	mb=4.0
	SONN				
	GRLB				
	BUCH				
12.06.	13:23:31	10.7S	156.1E	(Santa Cruz)	mb=4.9
	BUCH				
12.06.	13:35:12	10.7S	156.1E	(Santa Cruz)	mb=5.0
	BUCH				
	GRLB				
12.06.	13:39:40	10.8S	156.2E	(Santa Cruz)	mb=5.7
	GRLB				
	SONN				
12.06.	15:38:25	74.9N	96.1W	(Queen Elizabeth Isl.)	mb=4.5
	BUCH				

12.06.	20:09:59 SONN GRLB	46.4N	12.6E	(North Italy)	md=3.8
12.06.	21:08:36 GRLB SONN	19.9S	176.5W	(Fiji Islands)	mb=4.7
12.06.	(12:01) GRLB	-------------		(Kattowice)	------
13.06.	(12:01) GRLB BUCH	-------------		(Poland)	ml=3.2
13.06.	21:31:49 SONN GRLB BUCH	28.4N	56.7E	(Iran)	mb=4.7
14.06.	02:27:06 GRLB SONN BUCH	50.0N	78.9E	(Kasachstan USSR)	mb=4.9
14.06.	07:43:45 GRLB	24.7N	140.9E	(Volcano Islands)	mb=4.5
15.06.	19:15:08 DRKR	3.4S	102.1E	(Sumatera)	mb=5.0
16.06.	08:08:49 SONN	51.6N	16.1E	(Poland)	ml=4.0
16.06.	(09:05) DRKR GRLB SONN	------------		(Germany,Bayr. Wald)	------
16.06.	09:02:30 GRLB SONN	7.0N	94.0E	(Nicobar Islands)	mb=4.0
16.06.	(09:21) SONN DRKR GRLB	------------		------	------
16.06.	(10:44) DRKR GRLB SONN	------------		------	ml=2.4
16.06.	(17:34) DRKR GRLB	-------------		(Mururoa)	------
16.06.	17:55:56 GRLB SONN	49.1N	6.9E	(France)	ml=2.5

17.06.	(08:00)	------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(08:20)	------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(09:00)	-------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(09:11)	------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(09:58)	------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(11:05)	------------	------		------
	DRKR				
	GRLB				
	SONN				
17.06.	(11:26)	------------		(DDR,Falkenstein)	------
	DRKR				
	GRLB				
	SONN				
17.06.	13:30:45	42.9N	77.5E	(Kasachstan USSR)	mb=5.3
	GRLB				
	SONN				
	DRKR				
17.06.	(14:28)	------------	------		------
	SONN				
	GRLB				
	DRKR				
17.06.	(14:45)	------------	------		------
	SONN				
	GRLB				
	DRKR				
18.06.	(10:55)	------------		(CSSR,Pilzen)	------
	DRKR				
	GRLB				
	SONN				
18.06.	(11:05)	-------------		(CSSR,Cheb)	------
	DRKR				
	GRLB				
	SONN				

18.06.	(11:26)	------------	------		------
	GRLB				
	SONN				
	DRKR				
18.06.	11:38:55	51.4N	16.3E	(Poland)	mb=3.8
	GRLB				
	SONN				
	DRKR				
18.06.	16:19:47	53.9N	85.1E	(Central USSR)	mb=5.0
	GRLB				
	DRKR				
18.06.	18:42:03	13.6N	91.1W	(Coast of Guatemala)	mb=5.2
	DRKR				
18.06.	20:12:27	13.6N	91.2W	(Coast of Guatemala)	mb=5.0
	DRKR				
18.06.	(22:39)	------------	------		------
	SONN				
	DRKR				
	GRLB				
18.06.	22:49:42	26.9N	110.9W	(Golf of California)	mb=5.8
	DRKR				
	GRLB				
	SONN				
18.06.	(23:05)	------------	------		------
	DRKR				
	GRLB				
	SONN				
19.06.	(10:27)	------------		(CSSR,Sokolov)	------
	DRKR				
	GRLB				
	SONN				
19.06.	(13:23)	------------	------		------
	GRLB				
	DRKR				
	SONN				
19.06.	13:05:05	18.2S	177.9W	(Fiji Islands)	mb=5.2
	GRLB				
	DRKR				
	SONN				
19.06.	(10:27)	-------------	------		------
	SONN				
19.06.	20:19:53	12.3N	121.1E	(Philippine)	mb=5.7
	GRLB				
	SONN				
	DRKR				

19.06.	20:24:13 DRKR	12.1N	121.1E	(Philippine)	mb=5.2
20.06.	(07:33) GRLB DRKR SONN	------------		(Austria,St. Poelten)	------
20.06.	07:51:23 GRLB SONN DRKR	43.9N	149.1E	(Kuril Islands)	mb=4.8
20.06.	(09:03) SONN DRKR GRLB	------------		(Germany,Regensburg)	------
20.06.	(09:30) GRLB SONN DRKR	------------		(CSSR,Brunn)	------
20.06.	(09:57) GRLB SONN DRKR	------------		------	------
20.06.	(10:19) DRKR GRLB SONN	------------		(CSSR,Most)	------
20.06.	11:54:55 DRKR GRLB SONN	51.2N	15.9E	(Poland,Lubin)	ml=3.5
20.06.	16:45:29 GRLB	11.0N	69.2W	(Venezuela)	mb=4.6
20.06.	(20:35) GRLB DRKR SONN	------------		------	------
21.06.	06:26:16 DRKR GRLB SONN	24.8N	45.8W	(North Atlantic)	mb=5.9
21.06.	(09:00) GRLB SONN DRKR	------------		(CSSR,Budejoice)	------
21.06.	(09:10) SONN GRLB DRKR	------------		(Germany,Gmuend)	------

21.06.	(09:57)	------------		(CSSR,Budejoice)	------
	GRLB				
	SONN				
	DRKR				
21.06.	(10:52)	------------		------	------
	DRKR				
	GRLB				
	SONN				
21.06.	(16:11)	------------		(Germany,Munich)	------
	DRKR				
	SONN				
	GRLB				
21.06.	16:02:55	3.7S	152.3E	(New Britain)	mb=4.4
	GRLB				
21.06.	21:22:43	19.1S	169.1E	(Vanuatu Islands)	mb=5.1
	DRKR				
21.06.	21:38:54	44.6N	148.9E	(Kuril Islands)	mb=5.6
	GRLB				
	SONN				
	DRKR				
21.06.	21:39:09	33.0N	54.0E	(Iran)	mb=4.1
	SONN				
	GRLB				
	DRKR				
22.06.	01:11:37	50.9N	19.4E	(Poland)	ml=3.0
	GRLB				
	SONN				
	DRKR				
22.06.	01:52:34	41.1N	16.2E	(South Italy)	md=3.0
	SONN				
	GRLB				
	DRKR				
22.06.	(07:53)	------------		(Austria,St. Poelten)	------
	SONN				
	GRLB				
	DRKR				
22.06.	(09:13)	------------		------	------
	DRKR				
	GRLB				
	SONN				
22.06.	(09:38)	------------		------	------
	DRKR				
	GRLB				
	SONN				
22.06.	(10:09)	------------		------	------
	SONN				
	DRKR				
	GRLB				

22.06.	(10:31) SONN GRLB DRKR	------------	------		------
22.06.	(13:13) DRKR GRLB SONN	------------	------		------
22.06.	21:53:08 DRKR	15.2S	168.2E	(Vanuatu Islands)	mb=5.4
22.06.	22:39:52 DRKR	27.9N	139.8E	(Bonin Islands Region)	mb=4.7
23.06.	01:31:56 DRKR	30.8N	50.0E	(Iran)	mb=4.5
23.06.	05:59:35 DRKR	15.1S	178.5W	(Fiji Islands)	mb=4.7
23.06.	(14:00) DRKR GRLB SONN	------------	------		------
23.06.	(14:37) DRKR GRLB SONN	------------	------		------
23.06.	(14:58) DRKR GRLB SONN	------------	------		------
23.06.	(15:04) SONN DRKR GRLB	------------	------		------
23.06.	(15:19) GRLB SONN DRKR	------------	-------		------
23.06.	15:39:32 DRKR SONN GRLB	39.0N	30.2E	(Turkey)	mb=3.7
23.06.	17:30:58 DRKR GRLB SONN	21.9S	139.0W	(Mururoa)	mb=5.3

24.06.	02:06:28	18.6N 121.0E	(Philippin Islands)	mb=5.3
	GRLB			
	SONN			
	DRKR			
24.06.	05:57:50	5.7S 145.3E	(New Guinea)	mb=5.4
	GRLB			
	SONN			
24.06.	(08:21)	------------	------	------
	SONN			
	GRLB			
	DRKR			
24.06.	(09:02)	------------	------	------
	DRKR			
	GRLB			
	SONN			
24.06.	08:57:54	10.2N 60.6E	(Trinidad)	mb=6.0
	DRKR			
	GRLB			
	SONN			
24.06.	(09:25)	------------	------	------
	DRKR			
	GRLB			
	SONN			
24.06.	(10:00)	------------	------	------
	DRKR			
	GRL3			
	SONN			
24.06.	(10:35)	------------	------	------
	SONN			
	GRLB			
	DRKR			
24.06.	10:30:30	6.9N 73.0W	(Northern Colombia)	mb=4.5
	DRKR			
24.06.	(11:07)	------------	------	------
	DRKR			
	GRLB			
	SONN			
24.06.	(11:15)	------------	(CSSR,Praha)	------
	GRLB			
	DRKR			
	SONN			
24.06.	12:25:40	6.3S 148.9E	(South of Tasmania)	mb=5.4
	GRLB			
24.06.	12:56:48	34.4S 177.9E	(Kermadec Islands)	mb=5.7
	GRLB			
	SONN			
	DRKR			

24.06.	(15:58)	------------		(Germany,Regensburg)	------
	DRKR				
	SONN				
	GRLB				
24.06.	22:06:51	37.2	137.8E	(Japan,Honshu)	mb=4.6
	GRLB				
	SONN				
	DRKR				
25.06.	06:24:23	33.4S	179.3W	(Kermadec Islands)	mb=5.6
	GRLB				
	SONN				
	DRKR				
25.06.	(06:49)	------------		(Germany,Weiden)	------
	SONN				
	DRKR				
	GRLB				
25.06.	(09:50)	------------		------	------
	DRKR				
	GRLB				
	SONN				
25.06.	(11:05)	------------		------	------
	DRKR				
	GRLB				
	SONN				
25.06.	(11:24)	------------		(Germany,Nuernberg)	------
	DRKR				
	GRLB				
	SONN				
25.06.	16:15:36	38.4N	43.1E	(Iran)	mb=5.3
	SONN				
	GRLB				
	DRKR				
25.06.	18:20:46	40.3N	63.9E	(UZBESSR)	mb=4.4
	GRLB				
26.06.	04:18:31	31.3N	64.8W	(North Atlantic)	mb=5.1
	DRKR				
	GRLB				
	SONN				
26.06.	06:01:28	25.0S	177.0W	(Fiji Islands)	mb=3.6
	GRLB				
	SONN				
	DRKR				
26.06.	(07:05)	------------		------	------
	DRKR				
	GRLB				
	SONN				

26.06.	07:03:23 DRKR GRLB SONN	10.2N 60.6W	(North Atlantic)	mb=5.0
26.06.	09:22:58 GRLB SONN DRKR	46.3N 144.1E	(Okhotsk)	mb=5.2
26.06.	(11:06) DRKR GRLB SONN	------------	(CSSR,Sokolov)	------
26.06.	(11:24) DRKR GRLB SONN	------------	------	------
26.06.	(11:57) DRKR GRLB SONN	------------	------	------
27.06.	00:33:27 DRKR GRLB SONN	32.0S 180.0W	(Kermadec Islands)	mb=3.8
27.06.	06:07:51 GRLB SONN DRKR	20.2S 169.3E	(Vanuatu Islands)	mb=5.8
27.06.	(06:30) SONN GRLB DRKR	------------	------	------
27.06.	(06:54) DRKR GRLB SONN	------------	------	------
27.06.	(07:53) SONN GRLB DRKR	------------	------	------
27.06.	(08:19) DRKR GRLB SONN	------------	------	------
27.06.	(09:03) GRLB SONN DRKR	------------	------	------

27.06.	09:23:17	17.9S 178.1W (Fiji Islands)	mb=5.2
	GRLB		
	SONN		
	DRKR		
27.06.	(10:19)	------------ ------	------
	DRKR		
	GRLB		
	SONN		
27.06.	12:08:21	20.8S 179.0W (Fiji Islands)	mb=4.7
	GRLB		
	SONN		
	DRKR		
27.06.	13:54:11	17.7S 176.7W (Fiji Islands)	mb=4.9
	DRKR		
27.06.	(15:18)	------------ ------	------
	DRKR		
	GRLB		
	SONN		
27.06.	16:15:46	21.8S 179.2W (Fiji Islands)	mb=5.4
	DRKR		
	GRLB		
	SONN		
27.06.	17:48:11	38.0N 11.0E (Sicily)	mb=3.5
	DRKR		
27.06.	(18:42)	------------ ------	------
	GRLB		
	DRKR		
	SONN		
27.06.	18:43:22	37.1N 121.9W (Central California)	mb=4.8
	DRKR		
27.06.	21:36:59	45.0N 142.0E (Japan)	mb=3.8
	DRKR		
28.06.	02:30:19	20.1N 95.0E (Burma)	mb=4.5
	GRLB		
	SONN		
28.06.	(08:56)	------------ ------	------
	DRKR		
	GRLB		
	SONN		
28.06.	(09:02)	------------ ------	------
	DRKR		
	GRLB		
	SONN		
28.06.	(09:15)	------------ ------	------
	DRKR		
	GRLB		
	SONN		

28.06.	(09:35)	------------	------		------
	GRLB				
	DRKR				
	SONN				
28.06.	(09:43)	------------	------		------
	SONN				
	GRLB				
	DRKR				
28.06.	(12:44)	------------	------		------
	SONN				
	DRKR				
	GRLB				
28.06.	(13:07)	------------	------		------
	SONN				
	GRLB				
	DRKR				
28.06.	(14:31)	------------	------		------
	DRKR				
	GRLB				
	SONN				
28.06.	16:47:34	4.0S	99.0E	(Sumatera)	mb=5.3
	GRLB				
	SONN				
	DRKR				
28.06.	18:47:50	30.5N	70.9E	(Pakistan)	mb=4.7
	GRLB				
	DRKR				
28.06.	20:52:48	25.7N	95.7E	(Burma/India Border)	mb=4.8
	GRLB				
28.06.	(21:43)	------------	------		------
	SONN				
	GRLB				
	DRKR				
29.06.	02:31:56	40.3N	42.0E	(Turkey)	mb=4.4
	SONN				
	GRLB				
	DRKR				
29.06.	(16:31)	------------	------		------
	DRKR				
	SONN				
	GRLB				
29.06.	(19:59)	50.8N	10.4E	(Germany,DDR Eisenach)	ml=2.3
	DRKR				
	SONN				
	GRLB				

29.06. 20:45:42 SONN GRLB DRKR	39.0N 139.0E	(Eastern Sea of Japan)	mb=5.[illegible]
29.06. (21:44) GRLB SONN DRKR	------------	------	------
30.06. (01:05) SONN GRLB DRKR	------------	------	------
30.06. (07:41) DRKR GRLB SONN	------------	------	------
30.06. (09:01) DRKR KIBG SONN	------------	(Germany,Regensburg)	------
30.06. (10:30) DRKR KIBG SONN	------------	(CSSR,Pilzen)	------
30.06. (11:04) DRKR KIBG SONN	------------	------	------
30.06. (11:39) SONN KIBG DRKR	------------	------	------
30.06. (16:44) DRKR STEI KIBG	------------	------	------
30.06. (20:43) KIBG DRKR STEI	------------	------	------
01.07. 02:07:00 DRKR	16.2S 177.8W	(Fiji Islands)	mb=5.5
01.07. 02:55:32 DRKR	16.2S 177.7W	(Fiji Islands)	mb=5.5
01.07. (09:30) DRKR KIBG STEI	------------	------	------

01.07.	(09:47)	------------	------	------
	KIBG			
	DRKR			
	STEI			
01.07.	(11:06)	------------	------	------
	KIBG			
	STEI			
	DRKR			
01.07.	(11:24)	------------	------	------
	KIBG			
	STEI			
	DRKR			
01.07.	(12:50)	------------	(CSSR,Praha)	------
	DRKR			
	KIBG			
	STEI			
02.07.	03:30:37	33.4N 140.8E	(Japan,Honshu)	mb=4.8
	DRKR			
02.07.	10:01:30	14.3S 167.2E	(Vanuatu Islands)	mb=5.9
	DRKR			
02.07.	10:54:53	26.0N 128.5E	(Ryukyu Islands)	mb=5.3
	DRKR			
03.07.	05:09:42	24.7S 179.3E	(South of Fiji Isl.)	mb=5.6
	DRKR			
03.07.	08:19:18	22.0N 94.3E	(Burma)	mb=5.2
	DRKR			
03.07.	(10:08)	------------	(CSSR,Most)	------
	DRKR			
	KIBG			
	STEI			
03.07.	(10:24)	------------	(CSSR,Sokolov)	------
	DRKR			
	STEI			
	KIBG			
03.07.	(11:42)	------------	(CSSR,Most)	------
	DRKR			
	STEI			
	KIBG			
03.07.	(11:56)	------------	------	------
	KIBG			
	STEI			
	DRKR			

03.07.	(23:21)	------------		------	------
	DRKR				
	KIBG				
	STEI				
03.07.	11:43:14	8.9N	137.9E	(West Caroline Isl.)	mb=5.9
	DRKR				
04.07.	08:26:36	33.0S	178.0E	(North of New Zealand)	mb=4.6
	DRKR				
	KIBG				
	STEI				
04.07.	(10:52)	------------		(CSSR,Pilzen)	------
	DRKR				
	KIBG				
	STEI				
04.07.	(12:06)	------------		------	------
	DRKR				
	KIBG				
	STEI				
04.07.	(14:07)	------------		------	------
	DRKR				
	STEI				
	KIBG				
04.07.	(14:21)	------------		(Germany,Regensburg)	------
	DRKR				
	KIBG				
	STEI				
05.07.	(08:01)	------------		(CSSR,Brunn)	------
	KIBG				
	STEI				
	DRKR				
05.07.	(09:36)	------------		(CSSR,Pradubice)	------
	KIBG				
	DRKR				
	STEI				
05.07.	(09:43)	------------		------	------
	STEI				
	KIBG				
	DRKR				
05.07.	(09:58)	------------		(Germany,Zwiesel)	------
	DRKR				
	KIBG				
	STEI				
05.07.	(11:04)	------------		------	------
	DRKR				
	KIBG				
	STEI				

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